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ABSTRACT

The budgets of graduate and professional students were estimated, and the way that students met these expenses were analyzed. The average expenses of a student in graduate school in 1980-1981 were estimated to be $8,990, while the estimate for professional students was $10,550. It was estimated that roughly 10 percent of the amount spent by graduate students was derived from fellowships and traineeships, and that another 30 percent was derived from stipends that required some work (i.e., teaching and research assistantships). Roughly a fifth of graduate students' budgets was financed by loans, and the remaining 40 percent or so came from student savings, other work, or parental aid. The question of who should pay for graduate education is addressed and two alternative rationales for support to predoctoral students are suggested: the need to maintain the nation's research capability, and extending federal responsibility for underwriting student expenses at the undergraduate to the graduate sector. In addition, several alternative aid approaches for graduate and professional students are described and costed, including the level of stipends and the number of fellowships and traineeships. (SW)

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SUPPORT OF GRADUATE AND PROFESSIONAL STUDENTS

by

Joseph Froomkin

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EXECUTIVE SUMMARY

The next few years will be extremely difficult for the graduate establishment as a whole, and particularly so for graduate and professional students. While the Administration is taking steps to reduce the total volume of aid available to pre-doctoral students, it has already reduced support to the behavioral sciences. At the same time, the universities are hard pressed for operating funds and have trouble keeping their aid to students in line with increasing costs. Congressional decisions will therefore play a major role in shaping both the size and the composition of the post-baccalaureate establishment.

There is very little recent data to guide policy-makers in formulating new aid policies for pre-doctoral students. The last large-scale study of patterns of paying for the cost of graduate schooling was conducted in 1965, for instance. Hence, the main objectives of this report are 1) to estimate student budgets, and 2) to analyze how students met these expenses.

The latest year for which estimates of student expenses could be obtained was 1980/81. We estimate that the average expenses of a student in graduate school that year were $8,990, and that students in professional schools spent $10,550. With 480 thousand students enrolled in graduate school full-time and 275 thousand full-time professional students, the total outlays of students attending full-time amounted to roughly $7.3 billion. In addition, part-time or part-year students enrolled in programs beyond the bachelor's level spent $1.7 billion on tuition alone during that year.

We estimate that roughly 10 percent of the amount spent by graduate students was derived from fellowships and traineeships, and that another 30 percent was derived from stipends which required some work, i.e. teaching and research assistantships. Roughly a fifth of graduate students' budgets was financed by loans, and the remaining 40 percent or so came from student savings, other work or parental aid.

A much smaller proportion of the budgets of professional students came from fellowships or traineeships. On the average, professional students obtained eight percent of their budgets from fellowships or scholarships in 1980/81. Students in law, dentistry and other programs got only four percent. Needy medical students aided by the federal government got the bulk of the aid in 1980/81. Since that year, the program has been discontinued, and currently less than four percent of medical students' budgets comes from scholarship and fellowship sources. Medical students borrowed more than the average professional students, roughly a third of their budgets, in 1980/81. Other professional students borrowed a quarter of their expenses. Two thirds of the expenses of all professional students came from work, savings or parental support.

In the past few years there have been important shifts in the way student budgets are financed. Comparing the pattern of financing in 1965 and 1980/81, we note that the role of fellowships and traineeships in the budgets of graduate students declined from 24 to 10 percent. By contrast, research assistantships played a much more important part, financing nine percent of student expenses in 1965 and 15 percent in 1980/81. Much of this increase was caused by the larger amount of money available from federal research and development funds, which increased in real terms by at least 50 percent in the interim period. The part of expenses paid by teaching assistantships increased only modestly from 11 percent to 15 percent between these two dates.

The most dramatic change in the financing of graduate students took place as the role of borrowing shot up, rising from less than one-thirtieth of graduate student budgets to between one quarter and one fifth of the total. Professional students also increased their reliance on loans. Information collected by professional associations highlights the fact that each succeeding class of doctors, dentists, etc. since 1974 has a higher debt than the one before.

Estimates of sources of student support for 1980/81 by source show that some $531 million of aid and stipends to full-time graduate students was provided by the federal government. Roughly a billion dollars was shouldered by institutions. Support from other sources, states, foundations and the private sector contributed less than $126 million.

The federal role in student support has changed radically since the end of the 1960's. The number of fellowships and traineeships declined by half, from some 52 thousand in 1970 to 26 thousand in 1980/81. Some of this decline was offset by an increase in the availability of research assistantships, but these benefitted mostly students in the science/engineering fields. Both fellowship and research support to pre-doctoral students in the humanities and education declined significantly throughout the 1970's.

University support more than kept up with the increase in student outlays, and other support also increased in importance, except for the past two years, when state support faltered. Starting with a very small base, the other sources of support would have to grow very rapidly to play an important role in the finances of graduate students.

There is no concensus about what should be done to support pre-doctoral students. A survey of the recommendations of a number of commissions and study groups indicates that this issue is not very high on most policy-makers' agendas. For instance, the Carnegie Council on Higher Education failed to address this issue in their final report, issued in 1980. A group of fifteen college presidents who were asked to make recommendations to the Fort Foundation in 1978 called for a modest program of scholarships and traineeships for scientists, engineers and humanists; the total number of these stipends would probably be less than what was available in 1980/81. A committee set up by the National Academy of Sciences in 1975 to advise the Department of Health and Human Services recommended reducing the number of pre-doctoral fellowships in most fields year after year; in its latest published report, 1981, it called for increases in only two fields, nursing and health research.

The lack of enthusiasm for supporting pre-doctoral students can be explained easily: a surplus of persons with doctorates is haunting the United States. The number of faculty openings has been forecast to shrink each year for the next few years, and there is no prospect of increasing the number of research and development personnel either. The National Science Foundation has projected that outlays for research and development will grow no more than four percent in real terms between now and 1990, thus putting a damper on the prospect of growth in employment in that field. Surpluses of medical doctors, dentists and lawyers are also anticipated.

In the past, support for pre-doctoral students was justified by the threat of shortages of persons with doctorates. Unless a new rationale is developed for the support of all pre-doctoral education, it is difficult to justify increases in support, or even to maintain present levels of support. Two alternative rationales for support to pre-doctoral students are suggested in the report: (1) the need to maintain the nation's research capability, and (2) extending federal responsibility for underwriting student expenses from the undergraduate to the graduate sector. Since neither of these rationales can be sustained in purely economic terms, decisions in this area will have to be made on a political basis.

We suggest that if either rationale is accepted as a basis for policy action, certain steps be taken to formulate a more rational policy for graduate education: (1) extending federal stipends to students in the humanities and other non-science fields, (2) tying the research assistantship programs more closely to the federal government's basic research goals, and (3) possibly increasing the stipends to students to bring them closer to the wages which they could command in full-time employment, since only a few of the doctorate recipients will benefit financially from additional schooling. As long as graduate study is seen as an activity to advance social goals and is no longer regarded as a way to increase future incomes, borrowing by graduate students should be de-emphasized.

A variety of alternative programs of aid to graduate and professional students are described and costed at the end of the study. They range from proposals to increase the number of fellowships while keeping stipends constant to raising stipends to $12,000 per student, and include other programs which would equalize support between different groups of pre-doctoral students.

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The current year, 1983, is a critical year in the support of graduate and professional students by public authorities and by universities. As a result of Administration pressure, federal policy towards these students is changing dramatically while state and local governments and universities, hard-pressed for operating funds, are finding it more difficult to increase the amounts that are earmarked for stipends to students enrolled in post-baccalaureate programs. Thus, past trends may no longer be a portent of the future. No more appropriate -- or difficult -- time could be chosen to review the trends and objectives of student support in this important sector.

THE POST-BACCALAUREATE STUDENT UNIVERSE

At least 1.5 million students were enrolled in graduate and professional programs in the fall of 1982. The last accurate count available at the time of this writing is for the fall of 1981, when 1.6 million students were reported to be enrolled in these programs.[1] There are indications that graduate and professional enrollments declined between the fall of 1981 and 1982. For instance, the Council of Graduate Schools reported that enrollments in this association's member schools declined by 1.1 per cent.[2]

In the recent past, roughly one million students were enrolled in degree-credit programs in graduate schools and another 275 thousand in professional programs. The rest were unclassified, but presumably following non-credit programs or programs leading to a certificate.[3] Roughly half of the degree-credit students were enrolled full-time, but the proportion of full-time to part-time students varied considerably between students in the schools of arts and science, which reported less than one-half of all students enrolled full-time, and professional schools. The vast majority of professional students were enrolled full-time. (Table 1.)

The total number of part-time students who attend courses offered by colleges and universities in a given year is three to four times higher than the enrollment reported in the fall. A recent survey placed summer enrollment at 2.5 million.[4] Other estimates, based on retrospective surveys of baccalaureate recipients enrolled in part-year or part-time programs in colleges and universities, place their number at nearly 3.7 million. A significant number of students who were uncounted by the fall enrollment statistics are teachers and health professionals attending summer programs. (Table 2.)

TRENDS IN ENROLLMENTS

The current level of post-baccalaureate enrollments is the result of impressive growth in the number of graduate and professional students (students in programs for which no undergraduate professional degrees are awarded) during the 1960's, followed by slower growth during the early 1970's. Since 1976, the level of enrollments of both graduate and professional students has been virtually stable.

Most significantly, between 1980 and 1982 the reported figures for fall enrollments scarcely changed at all, and professional enrollments declined slightly for the first time in the 12 years for which a consistent series is available. There are indications that enrollments in the fall of 1982 were even lower. For the first time in decades, the number of students admitted to medical schools declined from the level of the previous year.[5] The possibility that all post-baccalaureate enrollments will decline in the near future can no longer be ruled out.

In this paper, which is designed to examine levels of and trends in student support, we shall focus our attention on full-time enrollments, since the lion's share of student support is channeled to full-time students. As we already noted, the proportions of full-time students who are enrolled in professional and non-professional programs differ quite drastically. Among professional students seeking their first professional degrees in medicine, law, dentistry and veterinary medicine, roughly nine out of ten are enrolled full-time. Four out of ten students in the other post-baccalaureate programs are reported to be enrolled in full-time programs. Among those in the physical or life sciences and engineering, the proportion of full-time students was considerably higher, 66 per cent, and in the social sciences, it was 62 per cent. By contrast, only two out of ten graduate students in other disciplines attended full-time. (Table 3.)

Getting a fix on part-time enrollments is more difficult. Based on the fall enrollment series, part-time graduate enrollment doubled during the 1960's, increased 36 per cent during the first half of the 1970's, and appears to have grown more slowly since. The retrospective surveys of adult education, which are conducted at three-year intervals, confirm that part-time and part-year enrollments have stablilized. Currently, some 3.7 million students with bachelor degrees are enrolled in the courses for post graduate degrees in a college or university program. On the average, they carry a two-course load.[6]

ABILITY TO PAY FOR GRADUATE EDUCATION

Income distribution of graduate students is not published routinely by the Current Population Survey. Even the decennial census does not contain data on income distribution of graduate students.

The only information on the income distribution of graduate and professional students was obtained by this writer from the Survey of Income and Education conducted in 1976. The tabulations were run separately for dependent and independent students. Some 32 per cent of the full-time students were dependent on their families, and that the remaining 68 per cent were independent. Among dependent full-time students, two-thirds lived in families with incomes above the median. By contrast, independent full-time students appeared to be much poorer -- two-thirds had incomes below the male median income during that year. Both independent and dependent students who attended part-time came from relatively affluent circumstances. (Chart 1.) Aggregate statistics of all adult education participants collected by the U.S. Bureau of the Census for 1969, 1972, and 1975 show that participants fell in the same income category as the total population. In 1981, the median adult education participants had somewhat higher incomes, $20-25 thousand, as compared to $15-19 thousand for the total population.

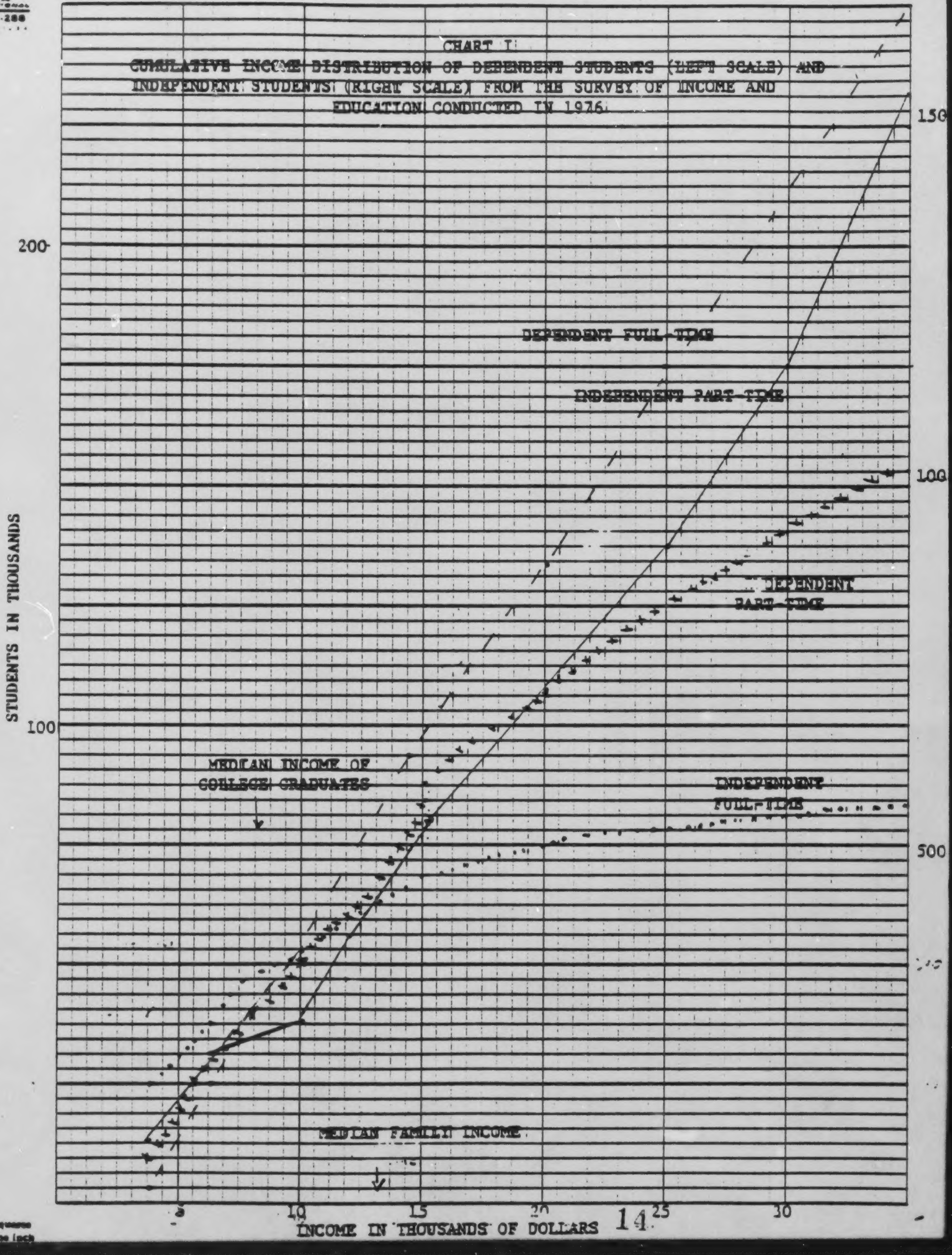

CHART I

CUMULATIVE INCOME DISTRIBUTION OF DEPENDENT STUDENTS (LEFT SCALE) AND INDEPENDENT STUDENTS (RIGHT SCALE) FROM THE SURVEY OF INCOME AND EDUCATION CONDUCTED IN 1976

COSTS OF ATTENDANCE

In order to determine the possible need for student aid, we need some estimates of the costs of attendance. Unfortunately, no comprehensive surveys of this cost have been conducted since 1965. This singular lack of interest contrasts with considerable activity in the field of graduate student finance during the period of rapid growth in graduate education. The National Opinion Research Center conducted two surveys during that time, one in 1958 and another in 1963, and the U.S. Office of Education surveyed the finances of graduate students in 1965.[7] According to this later survey, which reported on the expenditures of full-time students, the median expenses of full-time students were $2,785, with tuition and fees accounting for $785 of this amount.

For a more recent time period, an estimate of the expenditures of graduate and professional students can be gleaned from a survey by the Educational Testing Service of graduate and professional students who applied for aid to attend graduate and professional schools in 1980-81.[8] According to this survey, the mean expenses of students attending arts and sciences programs averaged $7,836 per student, or $3,659 million for all full-time students enrolled during that year. In all probability, the figure understates the total need of students since it does not take into account social security contributions on earnings, income taxes, etc. We would place the total outlays closer to $4,000 million. With tuition costs increasing $412 and the cost of living rising by 10.9 per cent from September 1980 to September 1981, the average cost of attendance that year can be estimated at $8,895.[9] A similar calculation for 1981/82, when prices rose 10.5 per cent, would place the outlays per student at $9,829. The estimates of total outlays range from $4,314 million to $4,745 million for 1980/81 and $4,718 million and $5,190 million for 1981/82. Assuming that prices will increase another five per cent, that average costs will amount to $8,373 and that posted tuition will escalate to $3,000, the estimate for the current year is $5,190 million to $5,709 million. The detailed calculations are reproduced in Table 4.

During the intervening period, 1965 to 1982, the costs of attendance increased from roughly $2,785 per student to $8,373-$9,000. The Consumer Price Index roughly tripled in those 17 years. Thus the cost of being a full-time student in real terms increased only slightly during the 17 years.

As we mentioned, there are no estimates of costs for intermediate years. Some idea of the interim developments can be garnered from Table 5, which reproduces the figures reported for tuition, room and board for public and private universities. The data in this table can be used to draw the conclusion that costs in real terms started escalating in the mid-1970's. In the late 1970's, these costs roughly paralleled the increase in the cost of living. Since 1981, and especially for the academic year 1983/84, tuition, room and board costs have outrun the increase in the Consumer Price Index as public institutions raised tuition to offset declining support from state legislatures, and private institutions (especially prestige universities) increased tuition to cover raises to faculty whose income lagged behind the Consumer Price Index during the 1970's.

In the case of professional students, the ETS study places mean outlays of law students in 1979/80 at $8,737. For medical students, the estimate is $10,685. Since other professional students have roughly the same expenditure patterns as law students, the average for all professional students was derived by weighing medical students' expenditures by one quarter and those of law students by three quarters, in proportion to their share of total professional enrollment. For 1979/80, the average cost for these students was calculated as $9,224 and the outlays for full-time students at $2,204 million. For subsequent years, the average expenditure was incremented by the same ratios as for graduate arts and science students, to arrive at total outlays of $2,613 million for 1980/81, $2,908 million for 1981/82, and $3,111 million for the current year. If the average cost is understated by the same amount as that of graduate students, it is quite possible that the outlays could amount to some ten per cent more. (Table 4.)

Information on the educational costs of graduate and professional students who attend either part-year or part-time are quite scanty. According to the 1980 survey of adult education, the average cost per course was $235 for students enrolled in part-time graduate or professional degree programs. Since their number was estimated at 3.6 million, a total of 7.2 million courses were paid for by these students. Thus, their outlays for tuition alone amounted to $1,720 million in 1980/81. In the current year, with the rise in tuition estimated at over 20 per cent during the intervening period, these outlays could very well amount to as much as $2,064 million. If books, supplies and commuting costs were added to this figure, the total costs of part-time attendance could easily exceed this figure by 50 per cent.[10]

The lower limit of spending by full and part-time students during the current year could be between $9.6 billion and $10.8 billion. These are not formidable sums either, when compared to the Gross National Product or even the size of the projected federal deficit. If the financing of graduate student budgets deserves attention from policy analysts, this is due not to its size but to the importance of the graduate establishment's contribution to the intellectual capital of the nation.

SOURCES OF GRADUATE AND PROFESSIONAL STUDENT SUPPORT

This section will analyze old estimates and present new estimates of graduate student and professional student support. The sources of educational financing for these two types of students will be discussed separately.

Graduate Student Support

Early Studies. We already mentioned that the National Opinion Research Center conducted two studies of graduate student support, one in 1958 and the other in 1963. The first study was based on the responses of 2,824 students, and the second, more ambitious effort, queried over 21 thousand students and obtained over 20 thousand responses from students in the arts, sciences and engineering.

It is not easy to report on the results of either study because information about full- and part-time students is not tabulated separately. By making certain assumptions about the characteristics of full-time students, e.g., that they are not likely to be employed full-time, it was possible to distinguish between the expenses and sources of support of fully-committed students (those either enrolled full-time or writing their dissertations) and the others.

The major findings of the two surveys are quite similar, and can be summarized as follows:[11]

1. Most students relied on multiple sources of support to cover their expenses.

2. Full-time students relied on stipends to cover the major share of their expenses. The university was the most important source of these stipends. More than one-half of all estimated fully committed students received some aid from the university. As of 1958, we estimate that three out of four graduate students received some aid or income from federal funds. By 1963, the proportion of students with this type of aid increased to four in ten. Most of the aid was channeled to students in the sciences.

3. Parents were not a major source of support to students. In 1958, for instance, 23 per cent of all graduate students and probably nearly half of all fully committed students received some parental support, but that support provided only a very small share of their budgets.

4. For full-time students who were married, and who accounted for nearly half of all full-time students, the earnings of spouses played an important part in their budget.

5. Most students had sufficient income to finance their education, and borrowing did not play an important part in student budgets.

In both 1958 and 1963, the typical single graduate student covered the major share of his expenses from stipends. Practically all students who attended full-time and were enrolled in the physical or life sciences and engineering, and the majority of students in the social sciences, also had such stipends. The proportion of students in the humanities who had stipends was lower, and the amount of their stipends was less.

The 1965 survey conducted by the Office of Education collected information separately for full-time graduate students' outlays, and also reported shares of the outlays provided by different sources of income. During 1965, some 40 per cent of the students attended full-time, but they received 87 per cent of all the stipends distributed that year. The federal government provided some 66 thousand of these stipends but, unfortunately, the survey does not report how much the stipends were worth. This survey did report that all stipends amounted to a total of $331 million and covered some 42 per cent of student expenditures for that year. Once again, parental contributions were reported to play a very minor role, less than 8 per cent of the financing of full-time students. Nevertheless, other sources of income appeared to be sufficient to keep student borrowing down to three per cent of the total outlays.[12]

Finances of graduate students in the 1970's. There are no estimates of budgets or sources of financing for graduate students during the 1970's. All we have is clues to the way they financed their education. Since 1974, the National Science Foundation has collected data about the major types of support by source of all full-time graduate students enrolled in the physical, life sciences, engineering and social sciences. These data, reported by heads of departments, are designed to show trends in the students' sources of support. (Table 6.)

These statistics show broad trends, but do not document the amount of money which students received. Nor are they precise indicators of sources of support from one year to the next. As long as students rely on multiple sources of support to finance their education, for example a teaching assistantship or fellowship as well as loans, any of the sources, which may be roughly equal, could be reported as a major source. Small variations in the amount of the stipend can affect the reporting quite substantially. For instance, in 1979, it was reported that the National Science Foundation awarded either fellowships or traineeships to 1,581 students. In 1980, the reported figure was 1,579 students. In fact, the number of fellowships declined from 1,850 to 1,750 in these two years, but the increase in the amount of the fellowship paid to students, from $4,320 to $4,800, may have accounted for a higher proportion of students reporting National Science Foundation moneys as their major source of support.[13]

There are additional grounds to believe that the categories of aid reported to the National Science Foundation by department chairmen are not always accurate. Although the National Science Foundation does not support any traineeships, for instance, a number of those are reported to have been financed with N.S.F. funds. We believe that the data can be used as indicators of the distribution of aid by discipline, as well as rough indicators of trends.

The number of students reporting support from different sources shows amazing stability in the course of the past eight years. It would lead one to the conclusion that the pattern of support has not changed drastically since 1974.

Another source which reports on the pattern of financing of graduate students is the Office of Scientific and Engineering Personnel of the National Research Council. This office recently spread its wings and now surveys all doctorate recipients from United States universities. From 1978 to 1981, the office published data on primary or major sources of support for all doctorate recipients for the years 1978 through 1981. The data indicates little change in support patterns. The small decline of respondents reporting federal sources as primary, from 14.9 to 13.7 per cent, and the increase of loans from 1.2 to 1.8 per cent of respondents, do not indicate any drastic shift in support patterns.[14]

Recent doctorate recipients report that university sources still account for a major share of reported primary sources, in excess of 40 per cent in each year. Family (parental) contributions are mentioned by only one in fifty Ph.D. recipients as a primary source in any of the four years. (Table 7.)

For our purposes, an even more interesting comparison is the response of 1981 doctorate recipients to the question asking them to recall all sources of support for their graduate education. The respondents reported an average of 2.7 sources of support per student. Since sources of support providing a higher amount per year are more likely to be mentioned as primary sources, we have ranked these sources of support by the ratio of primary to total sources reported.

Table 6 shows that stipends from research assistantships, federal support, self-support and teaching assistantships are likely to be reported more often as primary support and can be assumed to be sizeable. University fellowships and industry sources fall in the middle range. Parental support and loans play a much smaller role in the primary support of students.

Sources of Support to Graduate Students 1980/81. In order to estimate sources of support by major discipline area, a number of complicated estimating procedures, detailed in Appendix I, were undertaken. Considerable care was taken to estimate the number of available fellowships and traineeships, research assistantships and teaching assistantships. These posts were allocated first to major discipline areas (physical sciences including mathematics, life sciences, engineering, social sciences, and all other graduate majors). Secondly, the number of positions supported by federal, school, and other sources was estimated. A variety of sources were used to derive these estimates: information on major sources of support from the National Science Foundation, data collected by the National Research Council, as well as data collected by the Council of Graduate schools.[15]

Levels of support for each type of position, by discipline, were also derived from a variety of sources. For the federal share, special tabulations from the National Institutes of Health provided estimates of traineeship stipends in the life sciences; the National Science Foundation's fellowship scale was adopted to represent the typical stipend in physical sciences and engineering; stipends to teaching assistants and the average tuition in 1980/81 ($3,100) were used to derive the amounts of money paid to stipend holders in the social sciences and the humanities. We estimated that $531 million were available from federal sources.

The amounts paid to fellows, teaching assistants and research assistants from school funds and other sources were derived as follows: (1) The stipends paid to teaching assistants in chemistry, as reported by the Council of Graduate Schools, were used for all physical, life and engineering students. The stipends to assistants in economics were applied to all assistants in the social sciences, and the stipends to English assistants were applied to the other disciplines. (2) The tuition remission was set at $2,665, on the assumption that 15 per cent of these assistants held more than one stipend and tuition can be remitted only once. The adjustment for multiple holding of stipends was derived from early studies of student support conducted by the National Opinion Research Center, and is consistent with the adjustment of major sources of support reported by the National Science Foundation. These estimates of stipend support from the schools totaled $1,050 million.

Support from other sources was estimated at $126 million.

The summary of these computations by source of funds and by major field is reproduced in Table 8. These estimates amount to $1.7 billion in stipends for all graduate students.

Another estimate of available support by source was prepared using alternative sources. The federal obligations for fellowships, traineeships and training grants reported to the National Science Foundation were decremented by the amount obtained by multiplying the number of federally-funded postdoctoral fellowships by the average stipend reported in a special tabulation of the National Institutes of Health. A few small amounts were added to this figure: the traineeships available from nurses' programs; an estimated $45 million for teacher training, mostly from handicapped children's programs of the Department of Education; and an additional $3.5 million for certain small programs, such as the U.S. Department of Labor's economics dissertation support, which appear not to have been reported to the National Science Foundation. This alternative estimate of federal support for fellowships and traineeships placed the amount at $206 million, while the first estimate put the federal outlays at $221 million.

An alternative estimate of funds to research assistants from federal sources was derived from a 1972 National Science Foundation study which estimated the proportion of federal research grants used to support graduate students. Different proportions of funds, agency by agency, were allocated to derive the support, which amounted to $346 million, compared to $303 million in the estimates based on the number of stipends. Thus, total federal support was very close under both methodologies, $531 million with the original methodology, and $551 with the alternative methodology.

An alternative estimate of school support was derived in two steps. All scholarship funds and tuition remission for research and teaching assistants were derived by assuming that 21 per cent of the graduate student tuition and another four per cent of the total tuition of all universities was available to this end. Since an analysis of Higher Education General Information Systems financial reports indicated that universities spend 21 per cent of their tuition on student aid, while four-year institutions spend only 17 per cent, we could deduce that roughly four per cent of all revenues from tuition plus 17 per cent of graduate tuition was spent to provide fellowships and tuition remission to graduate students. This amounted to $328 million. The amount paid to research assistants was estimated at 15 per cent of the research funded by schools themselves. This 15 per cent figure was adopted from the National Science Foundation 1972 analysis of federal research projects, which showed that both highly theoretical and highly practical projects used graduate students more heavily than the average. Total stipends came surprisingly close to the $1.0 billion estimated by the alternative method.

With respect to other support, the total for fellowships and traineeships was estimated by adding (1) the reported support to graduate students by state departments of education and (2) specific grants for graduate education as reported in the Foundation Grants Index.[16] It is not surprising that our alternative total falls far short of the first estimate. Corporations and private individuals gave $221 million for scholarship aid to colleges and universities. Most of it was not identified as being specifically for graduate students. Possibly 10 to 15 per cent of this amount benefits graduate students, although only three per cent was specifically identified for that purpose. If so, both estimates of student aid would amount to some $45 million. Using the same methodology as in the case of schools, the contribution to graduate student stipends from research and development funded by sources other than the federal government or schools was $96 million, as contrasted to $81 million as derived by the first method. The total support by either methodology was $116 to $126 million. (Table 9.)

The similarity between the levels of funding estimated by either methodology gives us some confidence that the estimates are reasonable if not accurate to the last decimal place. The amount of stipend support from federal government moneys is less than a third of the total, and the stipends financed by schools amount to nearly 60 per cent of all stipends. State and private sources account for less than one-thirteenth of the money available for this purpose. Institutions, it appears, continue to play a key role in the support of graduate students. Federal funds are also an important source.

Another interesting point made by our analysis is that student support is uneven by discipline. Students in the physical and life sciences or engineering are more generously supported than students in the social sciences, while students in the arts, humanities, and other disciplines, including education, get the most niggardly support. Two ratios have been calculated to illustrate this point: (1) the average amount of stipend per full-time graduate student, and (2) the ratio of stipends received to average costs during that year. The amount of stipends of full-time students, and consequently the average level of stipends, is highest in the physical sciences, $6,538 and 73 per cent. These figures are considerably lower in the non-science-engineering fields, where the proportion of stipends is only 20 per cent of the average cost, and the average amount is $1,766. These disparities result from differing levels of federal government support as well as different levels of demand for teaching assistants relative to the total number of students. While the teaching assistants in the physical (including mathematics) and life sciences provide employment to as many as one in four students, in the "other" disciplines the ratio of teaching assistants to students is one to eight.

It was not possible to estimate the amounts borrowed by discipline. The total amount borrowed from different programs under government auspices was estimated at over $1.1 billion. The amount of guaranteed student loans, close to a billion dollars, was derived by subtracting borrowing by first professional students (see below) from an estimate of all of lending to post-baccalaureate students communicated informally by the U.S. Department of Education. During that year, the share of graduate and professional students in total borrowing was some 20 per cent. The National Direct Student Loans available to graduate students were also calculated as a residual after the total amount was estimated, and the share of undergraduate and first professional students was subtracted.

If graduate student proceeds from the federal work-study program are included, stipends, work-study and loans provided nearly three billion towards budgets estimated at $4.3 to $4.7 billion during that year.

Support of Professional Students During 1980/81

By contrast to the involved procedure used to estimate the stipends and borrowing of graduate students, the process of estimating the support to medical, dental, law, and other professional students (for which no undergraduate degrees exist) was much more straighforward.

In the case of medical students, reports to the American Medical Association and the Association of Medical Schools were used to estimate stipends and loans to medical students by source. A very slight adjustment (of about 3.3 per cent) was made to the reported data to account for the non-reporting of four medical schools.

The American Dental Association and the Association of American Dental Schools provided less detailed data on stipends to dental students by source, and aggregate figures on borrowing from the federal government and other sources separately.

The American Bar Association provided data on law students' resources from scholarships, work-study and borrowing.

These three professions account for slightly more than 70 per cent of all enrolled students, and the stipends and borrowing for the remaining 30 per cent was imputed, using as a model the statistics on dental student support. Many of the remaining professionals in post-baccalaureate programs are eligible for the same health professions programs as dentists, and it was reasonable that they would avail themselves of the programs just as dentists do.

In total, we estimated that first professional students received slightly over $200 million in stipends, and borrowed slightly over $700 million to finance their education. Among these students, the ratio of borrowing to stipends was very high: they borrowed $3.50 for each dollar they received in stipends. By contrast, arts graduate students borrowed only $0.64 for every dollar in stipends. (Table 10.)

Despite the high level of borrowing, professional students did not cover a high proportion of the cost of their education with stipends or borrowing. With the exception of doctors, who appear to borrow very heavily and covered over half of the cost with these two sources, the average first professional student obtained three-quarters of his funding elsewhere.

Trends in the financing of post-baccalaureate education

A historical perspective on trends in student support is afforded by a comparison of graduate student financing in 1965, the latest year for which a survey of student finances is available, and the estimates of this study for 1980/81. (Table 11.)

The comparison highlights two striking changes in the pattern of student finances during the past 15 years: (1) the proportion of student budgets financed by fellowships and traineeships was more than halved, declining from one-fifth to one-tenth of budgets and (2) loans, which played an insignificant part in the financing of graduate and professional education in 1965, provided a major source of support, roughly one-quarter of the total of student outlays, in 1980/81.

The contribution of research assistantships and teaching assistantships to the total budgets of graduate students increased moderately in the interim period. While in 1965 these two sources of support provided a fifth of graduate students' budgets, they accounted for one-quarter or more of these budgets in 1980/81. Universities appear to have made an effort to finance graduate students by shifting from scholarships to work-related stipends. The increase in the importance of moneys from teaching assistantships is no doubt due to the efforts of college administrators to control costs by keeping down the employment of full-time faculty. Consequently, as classes became larger, an increasing number of teaching assistants was used. The number of research assistants also grew, due to the relatively faster increase in research and development expenditures, between 1965 and 1981, compared to the cost of instruction and the cost of living.

There is no comparable series which can be presented for professional students. Yet the available evidence indicates that loans are playing a bigger part in the financing of education for students in medicine, dentistry and law. In 1974/75, 17 per cent of medical school student budgets was derived from scholarships, and an equal proportion was contributed by loans.[17] In 1975/76, for instance, out of the total $148 million loan and scholarship funds available to medical students, 54 per cent was in the form of loans. By 1980/81, the proportion had increased to 67 per cent. Despite the fact that scholarship funds roughly doubled, costs rose even faster. Law school students increased their borrowing from roughly $100 million in 1978/79 to some $240 million in 1980/81. The median debt of graduating dental students is reported to have increased from $10 thousand in 1978 to $25 thousand in 1982. It was $19.6 thousand in 1981.[18]

Graduate and professional student reliance on loans is increasing apace, and has accelerated in the course of the past two years. The brief historical review of graduate and professional support programs below will attempt to put this development into perspective.

RECENT DEVELOPMENTS IN THE SUPPORT OF GRADUATE AND PROFESSIONAL STUDENTS

Graduate Student Support by Federal Sources.

Federal graduate student support has been declining gradually since at least 1970, but in the past three years, federal support to graduate and professional students has been eroding even more rapidly.

Concern about the federal role in providing support for graduate students is not a recent phenomenon. As far back as 1968, the student support group of the Federal Interagency Committee on Education noted that economy drives in Congress were sapping the momentum of graduate student support. Between 1960 and 1969, total support increased from $25 to $226 million, nearly a ten-fold increase. More than 43 thousand students, nearly 13 per cent of all full-time graduate students, were supported by federal scholarships or traineeships in 1969, a four-fold increase from the estimate of students supported in 1960/61.[19]

While a number of programs were cut down in the following two years (e.g., the number of NASA fellowships and traineeships declined from 1,355 fellows in 1966 to 481 in 1970), the total number of fellowships and traineeships provided by the federal government increased to 53.8 thousand in 1969/70.[20] Our current estimate of available stipends from the federal government in the form of fellowships and traineeships for 1980/81 is 26.7 thousand, precisely one-half of the number reported in 1969/70.[21]

The decline occurred gradually, starting in 1970/71. The number of fellowships in all fields, except education, declined from 43 thousand in 1969/70, to 37 thousand in 1970/71, to some 22 thousand in 1973/74. Fellowships for teachers, mostly supported by NDEA Title IV programs, declined by roughly one-half, from ten to five thousand, between 1969 and 1975, according to informal estimates of former members of a now disbanded group set up in the late 1960's to administer the Education Professions Act. Currently, fewer than two thousand pre-doctoral fellowships are available to education majors. Of the 6.6 thousand new Ph.D.'s, only 214 reported receiving any support from federal traineeships and fellowships during their graduate career.[22]

It is astonishing that such an important area of federal activity has received so little statistical attention. Until 1979, the U.S. Bureau of the Budget, as it was then called, issued an annual special analysis dealing with education. The analysis contained a table which purported to summarize federal funds for graduate and, possibly, professional education. No one seems to have paid much attention to this table, and the year-to-year totals by agencies had a tendency to go up and down erratically. We could not trace the reasons for these fluctuations. Employees of the Budget Bureau either do not remember or never knew what was included in that table. We have tried to find out from the agencies that submitted the data what was included and excluded, but had to give up after half-a-dozen unsuccessful attempts. Institutional memory seems to have vanished from the federal bureaucracy. (Table 12.)

As best we can determine, the table reproduced below is not consistent from one year to the next. Most knowledgeable civil servants we talked to believe that the figures reported by the National Institutes of Health and the National Science Foundation are generally reliable. But there is less consistency in the amounts reported by the U.S. Office of Education and other Health, Education and Welfare programs. The most serious problems are in the data submitted by the Defense Department. In some years the total cost for service graduate schools is included, as well as the total cost and allowances for officers attending graduate programs full- and part-time and, very possibly, some portion of the research and development budget which the Department estimates is channeled to graduate research assistants. In the case of the Veterans' Administration, the major share of outlays is not for Veterans' allowances, but for part-year medical programs run by the Administration for health professionals. The original records from which this tabulation was compiled are no longer available, and the above are the best guesses based on numerous interviews with Agency personnel and a perusal of their annual budget submissions.

A somewhat better source for gauging the level of federal commitment to graduate student support, starting in 1966, is the series of federal obligations by agency to universities and colleges for fellowships, traineeships and training grants. These statistics are collected by the National Science Foundation. They list the moneys allocated to both pre- and post-doctoral fellowships, as well as funds for several training programs, most of whose money goes to institutions, with little if any given to students in the form of stipends. A series of compensating trends makes this series representative in our opinion: just as post-doctoral grants increased in importance, the training grants program was declining, and the proportion spent on graduate pre-doctoral students remained fairly constant. (Table 13.)

The series suffers from two other defects, however. The first is that the definitions are understood differently by different departments. For instance, the Department of Defense does not report any fellowships, etc., to the National Science Foundation, despite the facts that in 1981 1,100 officers were attending graduate programs at colleges and universities full-time, and that the Department sponsored a program of graduate studies in science or engineering for the top five per cent of the graduates of ROTC programs.

In addition, non-science fellowships and traineeships are not included in the tabulation. Moneys spent on subsidies to graduate teachers and health professionals and certain grants by agencies for programs in certain fields of the humanities, such as history, anthropology, etc., are beyond the scope of the series, which is limited to reporting data in the sciences.

The trends shown in the series are dramatic enough to indicate a drastic decline in federal obligations for graduate student support which would not be altered by any of the caveats. In 1969, $436 million a year was available for the fellowships, traineeships and training grants. Since then, the amounts have decreased by one-half. Since 1978, the total federal obligations reported to the National Science Foundation have been close to $200 million. In constant prices, the decline is even more dramatic, since consumer prices nearly doubled between 1967 and 1982. Support from federal funds for scholarships and training programs is down 75 per cent, in real terms, from the levels in 1969.

The cuts in support were not proportional by department, or by program within departments. For instance, the total obligations of Health and Human Services were cut by roughly one-half, but the National Institutes of Health's obligations actually increased by 20 per cent between 1972 and 1980. Nevertheless, the number of pre-doctoral students supported, mostly in the life sciences, declined by roughly one-third. Despite the fact that the increase in the amount of stipends lagged behind the cost of living, the modest increase in stipends and higher levels of reimbursed tuition caused fewer students to be funded. In ADAMHA, the traineeship program was cut substantially. The total number of traineeships and fellowships went down from 6,500 in 1977 to 4,303 in 1980/81. Further budget cuts in 1981/82 have probably cut the program down by another third. (No estimate for the agency could be provided as yet.) Fragmentary information on the ADAMHA training budget is that it will decline from $19 million in fiscal 1981 to $15 million this year, and will be at $14 million level next year.[23]

The general lack of concern with the support of predoctoral fellowships and traineeships translated itself into cuts of 75 per cent in the fellowship support distributed by the National Science Foundation between 1970 and 1982. The number of students supported declined from 7.3 thousand to fewer than 2.0 thousand during the current year.[24]

Many of the small graduate student support programs rise and fall as a result of changes in the ideology of either the Administration or the Congress. For instance, the occupational safety and health grants, part of the HHS budget, received $12.9 million in 1980. The appropriation was reduced to $7.6 million in 1981. The President's budget did not ask for any funds for this program either in 1982 or 1983, but Congress appropriated $5.76 million for the program in both fiscal 1982 and 1983. Other programs in departments under budget pressure were not so lucky: there is no trace of such smaller programs as the one operated by the Department of Housing and Urban Development, which supported 100 graduate students in 1971.[25]

Once a program disappears, it is practically impossible to find out what happened to it during its period of operation. The staff is not there any more, and records are shunted to some storage place which no one can identify. Such is the case of the Atomic Energy program of support, which was discontinued in fiscal 1973. The program, administered by the National Laboratories, distributed roughly $2.5 million in support per year in the early 1970's. There are indications that this program will be revived during the next fiscal year at nearly the same level of funding. Until 1979 the Department of Energy also funded a program of graduate traineeships, spending roughly a million dollars a year. This program, which we have been told was not funded during the past two fiscal years, is back in the department's budget.[26]

The shrinkage in graduate student programs in the sciences and engineering fields was nowhere as dramatic as the shrinkage in other fields, especially education. In fiscal 1970, the U.S. Office of Education was supporting nearly 15,000 predoctoral students. Slighly over half of those were supported by NDEA Title IV fellowships, a program which was subsequently phased out. In addition, there were 1,340 NDEA Title VI language fellowships, 750 research fellowships, over 3,500 teacher fellowships, and 350 library fellowships. Today there is still some money for language fellowships, but the number of students supported has declined to roughly three hundred a year. The program for training teachers of the handicapped is still being funded, but at 20 per cent less than in 1970. Probably between 1,500 and 2,000 teachers are still being trained with funds from this program. The other programs have been discontinued.[27]

The Veterans' Administration educational assistance program, which played a small role in the mid-1970's -- our estimates place its contribution at $262 million in assistance to 81,000 full-time students -- contributes less than $115 million to roughly one-quarter as many students today.[28]

The support for graduate education in nursing, an important special area of federal concern, is also eroding. A program of traineeships for nurses in graduate programs began in 1965 under the Nurse Training Act, when $8 million was appropriated for it. The appropriations grew until 1974, when they reached some $13 million. They remained at that level until 1982. In fiscal 1983, the amount dropped to $9.6 million. A small, one million dollar, nurse research fellowship program was started in 1977. Its funding has not increased in the past five years. Some funds for specialized graduate nurses' training were also made available by the National Institute of Mental Health during the period 1970-1981, about $10 million per year. No funds are reported to have been channeled to this program during the last two years. Some additional moneys from the Veterans' Administration and the Defense Department were also available. The bulk of the money from the V.A. went to short-term specialist training, but a small program of full-time scholarships existed in the 1970's. It was discontinued for a short time at the end of the decade and the beginning of the 1980's, but we have been told that 220 new fellowships were awarded in the 1983 fiscal year.[29]

Some graduate nurses also benefit from a special low-interest, six-per-cent loan program. The borrowing ceiling for this program is $2,500 per year, and no more than $10,000 per student. Thus nurses who borrowed as undergraduates can no longer avail themselves of these low-cost loans.

This not-too-detailed survey of developments in the support of graduate students can be summarized as follows: in 1970/71 there were an estimated 54,000 students supported by federal training and fellowship programs; our estimate for 1980/81 is 26,000 stipends of the same type. In 1981/82, the number of fellowships and traineeships shrank again. According to the National Science Foundation, the number of federal fellowships and traineeships reported as major source of support in science/engineering declined by 10 per cent from the previous fall. Major support from all federal sources, including research assistantships, declined most markedly in the social sciences (except psychology), by nearly 15 per cent, in environmental sciences, by 12.5 per cent, and in psychology by 10 per cent from the fall of 1980 to the fall of 1981.[30] As agency budgets were squeezed, the ideologically unfashionable environmental and social sciences suffered most.

Personnel at the affected agencies are concerned that the erosion of their budgets has only begun.

Professional student support by federal sources.

In the professional area, only medicine and allied health professions (dentistry, optometry, pharmacy, podiatry and veterinary medicine) benefit from special programs. The most important scholarship program in the field of medicine, the Health Professions Scholarship programs, administered by Armed Forces and the Public Health Service, provided some $40 million in funds in 1975/76 and grew to $92 million in 1981/82. By contrast, Physician Shortage Area scholarships, which amounted to $2.0 million in 1975/76, were discontinued by 1978/79. Other fellowships which required a service commitment roughly doubled from $6.0 million in 1975/76 to 1981/82. Scholarships for exceptional financial needs, which were available to first-year students starting in 1978/79 at some $3.0 million, were increased to $6.0 million, but are not likely to increase any more. It is significant that the Public Health Service scholarship program is currently being phased out, with no new fellowships awarded. Roughly 40 per cent of the federal scholarship support to medical students was wiped out.[31]

As we pointed out, medical students rely heavily on loans. The trends which escalated this reliance on loans in medical education were summarized by the Association of American Medical Schools. This summary is reproduced in text in Exhibit I.

It may be significant to add the following: an in-house analysis by the Health Professions Student Loan Assistance Program (which also provides aid to other health professionals) showed that appropriations for this program used to meet a third or more of the schools' requests for loans in the 1967/1972 period. This proportion declined precipitously to two per cent in 1982/83. The amount borrowed by students in the unsubsidized Health Education Assistance Loan program doubled from 1981/82 to 1982/83, as other aid did not keep up with the needs of medical students.[32]

EXHIBIT I

STATEMENT BY THE ASSOCIATION OF AMERICAN COLLEGES ON STUDENT FINANCIAL AID, MAY 1981

Student Financial Assistance. Given the escalation in student tuition and fees described above, current Federal health manpower programs providing financial assistance to medical students rely strongly upon the willingness of these students to borrow and thereby incur debts which, for many, will be difficult to repay even with the above-average incomes most physicians can expect to earn. This need to borrow and resulting indebtedness has the potential to discourage financially disadvantaged and underrepresented minority students from aspiring to careers in medicine, to draw physicians into higher paying specialties and geographic areas where income potential is greater and to pass the cost of repaying the indebtedness along to the consumer. The pervasiveness of indebtedness is illustrated by the fact that since 1971 over 70 percent of graduating medical students have had to borrow to finance their educations. The average indebtedness levels of graduating seniors with debt have risen remarkably from $5,500 in 1970-71 to $17,200 in 1979-80, a threefold jump. In the two years from 1977-78 to 1979-80, average indebtedness rose 25 percent or $3,400. The proportion of graduating students with educational debts of over $20,000 has increased from 18 percent in 1978 to 30 percent in 1980, and the percent of all students with debts of over $30,000 increased from 6 percent to 10 percent from 1978 to 1980.

There are three programs of Federal financial assistance solely for health professions students, which were most recently either authorized or reauthorized by the Health Manpower Educational Assistance Act of 1976: the Health Education Assistance Loan (HEAL) Program, the Health Professions Student Loan (HPSL) Program and the Exceptional Financial Need (EFN) Scholarship Program. The differences between the HEAL program and the HPSL program illustrate clearly the shift in Federal philosophy about student loans.

The HEAL program, which began in 1978, now provides loan funds directly to students from commercial lenders at interest which fluctuates quarterly at the bond equivalent interest of 91-day Treasury Bills plus 3.5 percent. Even at the previous maximum interest of 12 percent for these loans, a medical student who borrowed $8,000 per year for four years to cover tuition and living expenses—not an unreasonable need in these days of high tuition and high cost of living—would have to repay a total of $148,709 or $826 per month for 10 years starting three years after graduation in order to liquidate the debt. Under the present quarterly formula, HEAL interest has already gone well over 12 percent, and since HEAL borrowing maximums are $10,000 per year and $50,000 aggregate, a student could borrow significantly more than $32,000. Obviously, indebtedness from this program alone could be enormous.

In contrast, the HPSL program, which began in 1964, provides Federal funds directly to the schools to be awarded to students on the basis of exceptional financial need. Its interest of seven percent does not begin to accrue until completion of residency. The annual limit for borrowers is tuition plus $2,500, although schools rarely have these funds in sufficient quantity to offer maximum awards. Since it is financial-need based and administered by the schools, a better assessment of actual need is possible, thus making very effective use of Federal dollars. These loans are repaid to a revolving fund in the schools, and are available for reloan in subsequent years. HPSL loans also may be forgiven if a graduate agrees to practice in a designated physician shortage area, a feature which should encourage students with high debt to practice where they are most needed.

The *Exceptional Financial Need Scholarship* program initiated in 1978 unconditionally pays tuition and a stipend for living expenses for one year to students of exceptional financial need. It is the only Federal scholarship program without a service requirement and therefore the only real financial inducement to consider medical school for many financially disadvantaged and underrepresented minority students who would have to borrow significant sums even to start their medical education. However, its effect has been limited by the fact that it is available for only one year, and only about two percent of first-year medical students have qualified for it each year.

The Higher Education Act of 1980 reauthorized the Guaranteed Student Loan Program (GSLP) and the National Direct Student Loan Program (NDSL), both of which, although directed primarily toward undergraduate students, are open to medical students. Like the HEAL Program, the GSLP is a Federally guaranteed, commercial lender program that supplies funds directly to students. Unlike HEAL, interest above a rate of nine percent is subsidized while borrowers are in school. Lenders receive an additional special allowance from the Federal Government, which makes their return equal to the HEAL program. Its borrowing limits are $5,000 per year and $25,000 total. Since GSLP is an entitlement program available primarily to undergraduates as well as graduate and professional students, with no eligibility requirements beyond enrollment as at least a half-time student in an approved school, its cost to the Federal Government for the interest subsidy and special allowance is quite high. By comparison, the NDSL program, like HPSL, provides funds directly to the schools, but on a formula basis to the parent university so their availability to most medical schools is variable. The interest rate is four percent, and medical students may borrow to a maximum of $12,500.

There are also several Federal programs that pay tuition and living expenses in return for public service upon completion of graduate medical education. They are not intended to be financial aid programs although they are often used for that purpose.

Students receive awards regardless of their financial circumstances as an inducement for them to enter medical practice in an underserved area or in the armed forces. Of these programs, the Physician Shortage Area Scholarship Program has been discontinued. The National Health Service Corps Scholarship Program, after a significant growth during the past five years, reached a high of approximately 4,800 positions in allopathic medicine in 1979-80. In 1980-81 a substantial decline in new awards brought the total awards to 4,450 despite an increase in continuing awards. The Armed Forces Health Professions Scholarship Program has grown gradually from 3,600 positions in FY 1972 to approximately 4,400 in FY 1980 or from about 900 to 1,100 new positions per year.

The sources of student assistance for 1979-80 are shown graphically in Figure 9.

The Federal policy on student assistance has shifted steadily from one of unconditional scholarships and low interest loans from the Federal Government, awarded by the schools on the basis of financial need, to a revised posture that emphasizes higher interest loans from commercial lenders, awarded without concern for financial need. As a result, in an effort to save money Federal support for the direct, lower interest loan programs such as HPSL and NDSL has declined steadily during the past several years and the Health Professions Scholarship Program has vanished. However, the cost of one of the commercial loans, the Federally underwritten GSLP, has risen dramatically enough to threaten its future. At the same time, the virtually Federal cost-free HEAL Program could ultimately force such huge debts, especially upon financially disadvantaged and underrepresented minority students that it would be counter-productive to efforts to attract students into the profession and/or physicians in general into practice modes and geographic areas where they are most needed.

Source: Medical Education, Institutions, Characteristics and Programs, Washington, D.C., Association of American Medical Colleges: May 1981, pp. 3-4

The increased reliance of medical students on borrowing was documented by the American Association of Medical Schools for the period 1971 to 1982. The proportion of graduating physicians with indebtedness increased, and so did their average indebtedness. By 1982, 83 per cent of all graduating physicians reported some debt, and the average debt exceeded $21 thousand.[33]

Most knowledgeable observers believe that medical students' reliance on loans will continue to increase at an accelerated rate. Not only are tuitions in these schools escalating, but also an important scholarship source, the Public Health Professions Scholarships, are no longer available to second-year students as of last year. Many students who were financed by this program, which is targeted to medical school entrants of modest financial means and available to students for one year only, will have no other alternative than to borrow funds to continue their education.

Summary of federal support.

The peak in the role of the federal government in supporting graduate education was probably reached in the late 1960's. Since then, the share of federal money in student budgets has shrunk. Part of this decline is due to the decline in the number of fellowships and traineeships, and part to the failure of fellowship and traineeship stipends to keep up with the cost of living. Therefore, the number of students supported did not decline as much as the *real* value of obligations for that purpose. The failure of government stipends to keep up with the cost of living was a contributing factor in forcing students to borrow more to finance their education. Currently, borrowing plays twice as important a part in student budgets as scholarship funds.

Thus, in 1968, federal fellowships and traineeships to students ranged from $2,400 to $2,800. By 1974, they averaged $3,400. The National Institutes of Health held them at this level till July 1981, when the stipends were raised to $5,400. The National Science Foundation was somewhat more generous, raising stipends to $4,320 by fiscal 1977, and once again, to $4,800, in fiscal 1981. In fiscal 1982, NSF stipends were increased to $6,900, but no increase was put into effect by the NIH or ADAMHA. In 1980/81, the average fellowship or traineeship holder received one-third less in purchasing power than the stipend holder in 1968. By fiscal 1982, the NSF stipend holder was only slightly behind holders of stipends in 1966, but NIH-supported pre-doctoral students' purchasing power was less than $1,850 in 1968 dollars.[34]

The decline in fellowship and traineeship support was somewhat tempered by the increasing support available to physical, engineering, life and behavioral science students from research assistantships paid with federal funds. After an initial setback, when federal science research assistantships declined by seven per cent between 1967 and 1973, the number of research assistant jobs continued to increase. Between 1973 and 1981, the number of science students reported to have received major support from research assistantships increased from 22 to 29 thousand. This increase more than offset the reduction by three thousand in the number of students who received major support from fellowships and traineeships.[35]

As far as we can determine, no increase, and probably a decrease, in research assistantships with federal funds took place in the non-sciences, where fellowships and traineeships declined from some 16 thousand to an estimated six thousand in 1980/81. The National Endowment for The Arts and Humanities do not provide grants for pre-doctoral students, and most federal agencies, which have been forced to live with increasingly tight budgets lately, have been far less generous to historians, humanists and artists since these generally cannot contribute to the narrow scope of most agencies' assigned missions.

While in the late 1960's, the number of federal fellowships and traineeships certainly exceeded the number of research assistantships -- there were 40 thousand or so fellowships and traineeships in science fields in 1969/70, and 25 thousand research assistantships funded by federal projects -- today this relationship is reversed. We estimated that 26 thousand federal fellowships and traineeships were available in 1980/81, as contrasted to 36 thousand research assistantships.

The only new programs for graduate student support being initiated in the course of the current year are directed towards doctoral students in engineering. The Defense Department is establishing a new traineeship program which will provide stipends for nearly one hundred students, and the

Energy Department is likely to revive its small doctoral program for the training of engineers in specialties related to the nuclear program. The two programs will cost less than $5.0 million.[36]

Past history and outlook for non-federal sources of support.

The most important contributors to student support, well ahead of the federal government, are the universities themselves. However, the universities are becoming increasingly hard-pressed for funds and thus are becoming less generous with scholarship moneys. In the case of state institutions, both in the West and the Midwest, pressure from state legislatures to cut down the level of expenditures has affected these institutions' ability to support graduate students.

Private institutions have allocated increasing shares of endowment income and contributions to finance all students in the past year or two -- a fact not reflected in currently available statistics. The lion's share of this increase has gone to the post-baccalaureate component of their enrollment. Private professional schools have raised tuition faster than other programs of the university and have channeled a part of the increase into increased student aid. In 1965/66, for instance, we estimated (using the same methodology as in 1980/81) school aid at $150 million, a little under a quarter of all full-time student expenses. In 1980/81, a full billion dollars of stipends was available, but both costs and the number of students had escalated so fast that only 21 per cent of outlays were covered by school stipends. In 1965/66, for instance, we estimated (using the same methodology as in 1980/81) school aid at $150 million, a little under a quarter of all full-time student expenses. In 1980/81, a full billion dollars of stipends was available, but both costs and the number of students had escalated so fast that only 21 per cent of outlays were covered by school stipends.

In the long run, their ability to provide stipends to students depends to a large extent on (1) enrollments in undergraduate programs, since many stipends to graduate students are financed as teaching assistantships. Despite the slower growth of undergraduate enrollment in the past five years, the number of teaching assistantships has continued to grow. Many schools cut down on the size of the senior faculty and used teaching assistants to teach sections of large lecture courses. It is not clear to what extent this trend will continue. If enrollments at the undergraduate level decline by 20 to 30 per cent, there is little doubt that the number of available teaching assistantships will also decline, but the decline may not be proportional to the shrinkage in the number of undergraduates. In any event, it is unlikely that the number of teaching assistantships will increase in the near future. (2) Research and development funds are the other source of university-managed stipends for graduate students. In the past ten years, these amounts have increased faster than enrollments. In the near future, they are likely to remain relatively level. The federal appropriations, it is agreed, will favor engineering and other applied fields at the expense of basic research in the sciences and all research in the social sciences. The federal budget's change in emphasis has already cost the University of Chicago some 30 per cent of all funds available for the support of students in the social sciences.[37]

The possibility that graduate student support will be rescued by initiatives from either state governments or the private sector is slim. State support of fellowships has not kept up with the price level increases.[38] Appropriations for research are also suffering from the current recession and, most likely, will not recover for some time.

Private support, which plays a weak third fiddle after the support of universities and governments, has been growing apace, but most of the private (foundation, corporation and private donor) funds are traditionally channeled to general support of colleges and universities. While donations for student aid did double between 1970/71 and 1980/81, rising to $537 million in 1980/81, very little of this amount is earmarked for graduate students, and in the light of other financial needs of institutions, only a modest increase, perhaps 10-15 per cent a year, will be available to support students in pre-doctoral programs. Most professional schools, such as those in the health sciences and law, do not receive much support from private sources, and it is unlikely that they will be able to mobilize much support to support their students in the future.[39]

The highly-publicized, and increasingly criticized, linkages between corporations and universities generally involve medical schools and the development of new drugs. Students in these schools do not benefit much from these infusions of funds. Some additional moneys for research and development are available to medical and science departments from the private sector. According to the National Science Foundation, these amounts are likely to grow four per cent a year during the 1980's. Thus, stipends available to students from these sources are not likely to increase dramatically.[40]

There is no prospect of making up the cuts in federal aid from other sources. The future of graduate student aid is bleak, indeed.

Finances of Part-time Students

Very little is known about the finances of part-time students. In 1981, according to unpublished tabulations of the survey of adult education, their median income was $25 thousand. Analyses of attendance patterns in 1972 by this writer indicated that participation in adult education depended more on the educational level of the potential population, rather than their level of income. In other words, a college graduate was just as likely to participate in some adult education activity whether his income was low or high.

Roughly sixty per cent of all tuition and fees for adult courses are paid by participants or their families, with the remainder paid by employers or other organizations.[41] The federal government plays a substantial role in providing either low-cost or free instruction for a number of college graduates. For instance, the Department of Energy runs special seminars for college faculty. The National Science Foundation's summer programs to promote science education among teachers are also well known. Substantial resources are provided by the Veterans' Administration for the training of nurses in rehabilitation medicine and other specialties. Some money is still available in the Department of Education for summer institutes for teachers of handicapped students.

In most cases, the appropriations for these programs are not shown separately in agency budgets. Our conversations with agency personnel have convinced us that these appropriations have certainly lagged behind inflation and, in many instances, have not increased in real terms. Most of the programs have been short of funds since 1974/75, and have abandoned the practice, current in the 1960's and the early 1970's, of providing small stipends to participants. The National Science Foundation, for instance, used to pay teachers between $75 and $85 a week for expenses incurred in attending the program until 1975.

THE CHANGING PATTERNS OF STUDENT AID

The only facet of student financing which has not changed since 1969 is the support to part-time graduate students: a relatively constant 60 per cent of all part-time students reported having their tuition paid by either their employers or government in each of the adult education surveys conducted in 1969, 1972, 1975, 1978 and 1981.[42]

By contrast, full-time pre-doctoral students experienced drastic changes in the sources used to finance their education. Among graduate (other than professional) students, the role of fellowships in meeting student outlays declined from 24 per cent to 10 per cent between 1965 and 1980/81. Much of this decline must have taken place during the 1970's, when federal scholarship aid was scaled down drastically.[43]

Full-time students have had to rely much more heavily on stipends which require a work commitment. The number of teaching assistantships rose from 81 thousand in 1972 to 90 thousand in 1980/81. (This estimate is very much lower than the 134 thousand projected by the National Center for Educational Statistics, which includes a large number of junior part-time instructors in two-year schools. Many of these instructors are not full-time graduate students.) In the foreseeable future, it is quite likely that these numbers will continue to grow, as the need to economize on senior staff will encourage institutions to continue using cheaper, part-time graduate faculty.

The increase in graduate students' dependence upon research assistant stipends is even more dramatic. The National Science Foundation estimated that 22 thousand full-time graduate students in the sciences obtained their major support from research assistantships in 1968. In 1980/81, the number of such students grew to 68 thousand. By contrast, the total number of research assistantships outside of science fields appears to have remained virtually constant. A 1965 survey estimated their number at 13 thousand, not much different from our estimate for 1980/81. Students in the sciences benefitted from an increase in the research development funds channelled to universities by the federal government, an increase which amounted to 50 per cent in real terms between 1965 and 1981. The strained finances of the institutions that finance most research in non-science fields did not allow for an equivalent growth in funds for research assistants in other fields.

Though graduate student aid was unevenly distributed between disciplines even at the end of the 1960's, it is probably distributed more unevenly today. While we do not have the statistics to make a convincing case about the past developments of graduate student aid by discipline, some indicators of the uneven support in a recent year may not be out of place, and may provide some insights about future levels of support of students in different disciplines.

In the first place, there is a striking difference in the pattern of support to different fields by the federal government, by institutional sources, as well as by other sources. The federal government's support to non-science/engineering fields amounts to less than 10 per cent of all stipends available to graduate students. On the other hand, institutions allocated a third of their moneys to non-science fields. Nearly 80 per cent of private, foundation and state aid went to science/engineering fields and 20 per cent to other fields. Unless the finances of higher institutions improve--and there is little reason to believe that they will--non-scientists will continue to be at a disadvantage in marshalling support for their graduate studies.

There is an additional ground for concern: even in the non-science fields, aid appears to be available unequally to the three groups of disciplines included under this heading: professional fields, education, and the humanities. To judge by the reported sources of support of doctoral recipients in 1981, students in professional fields such as business and nursing appear to do slightly better than education majors or humanists in obtaining federal fellowships and traineeships to finance their graduate education. The proportion of Ph.D. recipients during that year who were recipients of federal scholarships was 12 per cent for humanists, 16 per cent for professional students, and only eight per cent for education majors. By contrast, humanists did much better than the others in obtaining aid from institutions. Some 47 per cent reported such aid, as contrasted to 30 per cent of professional students and 16 per cent of education majors.[44]

All three groups reported a relatively low incidence of support from research assistantships: 12 per cent for humanists, 18 per cent for professional students, and 15 per cent for education majors. Two-thirds of the humanists reported having received support from teaching assistantships, as contrasted to 44 per cent of the professional students and only 22 per cent of the education majors.

These three subgroups of graduate students fell behind the science/engineering majors who received their doctorates during that year in terms of federal scholarships and research assistantships. However, all, except education majors, were ahead in terms of institutional support. Surprisingly, only humanists were ahead of science/engineering students in the proportion reporting having received income as teaching assistants.

On the average, doctorate recipients in the humanities mentioned 1.36 major sources of support per respondent; in the professions, 1.08, and in education, .61. In the case of science students, the average was 1.49.

The patterns of attendance and the amount of the stipends per source of support probably played an even more important part than the number of stipends in determining the stipends' adequacy. For instance, 12 per cent of education majors also borrowed from the government loans programs, while 15 per cent of humanity doctorate recipients did. The lower proportion of stipends and borrowing by education majors can possibly be explained by the fact that many of them interrupt their studies or study part-time, and hence can accumulate higher personal resources to finance their education. Science/engineering doctorate recipients appear to be best-funded of all, as only 10 per cent reported borrowing from government programs.

WHO SHOULD PAY FOR GRADUATE EDUCATION?

The basic question underlying any discussion of federal policy towards graduate and professional support is, who should pay for graduate education? Dr. John D. Millet, who as head of a higher education department was the architect of postwar Ohio postsecondary education and a recognized authority on education issues, believes that:[45]

> At first glance, it seems relatively easy to answer the question...Certainly, there should be little reason to provide any different answer for graduate education from that for undergraduate education. If it is appropriate, as so many persons in our society profess, that the costs of undergraduate education should be shared by both student and society, then surely it is equally appropriate that the costs of graduate education should be shared by student and society.

Yet there is no general agreement on whether federal policy should be roughly the same towards graduate and undergraduate education. The federal objective in providing support to undergraduate education is to facilitate access to higher education institutions for students from families of modest circumstances. Once a student has graduated from college, however, it is difficult to argue that he belongs to the ranks of the underprivileged, since under ordinary circumstances he can obtain a job which will provide him with an above-average income compared to other persons of his age cohort.

Study group recommendations relating to the support of graduate education.

With the exception of special-interest groups, most recommendations about the level of support to pre-doctoral students are relatively modest. We reviewed five sets of reports which have dealt with the future of higher education: the report of the National Board on Graduate Education; reports put out by the Carnegie Commission and (later) Council on Policy Studies for Higher Education; the report of fifteen university presidents submitted to the Ford Foundation; a statement of the Association of American Universities distributed in 1983; and the periodic reports of the Committee on the National Needs for Biomedical and Behavioral Research Personnel.[46]

How many fellowships? In its final report, the National Board on Higher Education recommended 2,000 merit fellowships each year for a period of three years. It also recommended a total of 5,000 traineeships to be awarded by the federal government. This is a modest program, which would result in support well below the current levels undertaken by federal authorities.

Over the years, The Carnegie Council's recommendations have progressively de-emphasized the importance of federal support to graduate students. The final report of the Carnegie Commission on Higher Education in 1973 called for the federal government to assume more responsibility for financing graduate programs at the Ph.D., D.A., M.D. and D.D.S. levels. In 1975, in a report entitled The Federal Role in Postsecondary Education, Unfinished Business 1975-1980, the reconstituted Council reiterated recommendations for a three-pronged program of predoctoral student support. The program called for 5,000 merit fellowships for a two-year period to be awarded to beginning graduate students, an additional 5,000 fellowships to doctoral candidates, which would provide support for another two years, and some 2,000 traineeships each year for students in a limited number of newly developing fields requiring special encouragement. By 1980, in another report entitled Three Thousand Futures, The Next Twenty Years in Higher Education, there was no mention of any federal initiatives for aid to pre-doctoral students.

By contrast, the fifteen college presidents, most of them from research universities, have taken a more activist attitude. Their recommendations were motivated by the conviction that "student support, awarded on the basis of merit, is central to any effort to maintain the highest quality in advanced education and research and is an appropriate concern of national policy." The presidents also believed that a special effort is needed to increase the number of minority students who undertake and successfully complete the doctorate program. They felt that it is in the long-term interest of our society for the composition of university faculties to be more representative of the ethnic mix of the population.

Their principal recommendations can be summarized as follows: (1) the National Science Foundation should increase the number of three-year awards to 2,000, from the then-current level of 550. In the interim, they urged the provision of 1,500 one-year awards for the first year of graduate work, when most students either are not ready or can ill-afford the time to depend on teaching or research assistantships, (2) the National Foundation for the Humanities should start a program of 500 merit-based awards to students in the humanities, patterned on the program of the National Science Foundation, (3) the U.S. Office (now Department) of Education should implement a program of institutional grants specifically targeted to attracting and retaining minority students. Some of the funds, the presidents recommended, should be used for tuition and student aid.

The American Association of Universities, which represents all the major research universities in the United States, is less specific about the levels of graduate student aid which it would like the federal government to extend to pre-doctoral students. There is little doubt that they want more, since they state:

> First, federal support for graduate education has been reduced substantially over the last fifteen years. To sustain a level of excellence in graduate education -- especially in the context of sharply increasing international competition -- requires a reversal of this steady erosion of federal support.
>
> Second, too many critical needs are served by graduate education to leave it an orphan of national policy.

The association recommends the introduction of a new category of institutional fellowships, in addition to the individual fellowships which are portable, and also urges that the merit program be extended to arts and humanities graduate students. The new institutional fellowships would be awarded to departments, thus assisting "deserving departments to assure adequate enrollments of strong candidates." The association is also concerned with graduate students' increased reliance on loans.

While the National Board, the Carnegie Council, the presidents who were invited by the Ford Foundation, and the American Association of Universities are concerned with broad, lon-range policy decisions, the Committee on a Study of National Needs for Biomedical and Behavioral Sciences has the complex charter of assessing and recommending the number and type of fellowships and traineeships to be awarded in the Biomedical and Behavioral Sciences by the Department of Health and Human Services. The Committee was established in 1975, and has produced a report every year. Its latest published report is for 1981.

The Committee's advisory panels on basic biomedical sciences, behavioral science, and clinical science, as well as the committee as a whole, are made up primarily of academicians. It is thus surprising that they have had the courage to recommend continuous cuts in programs for pre-doctoral fellowships. In the behavioral sciences, where the number of fellowships for this type of student declined from 1,500 in 1975 to 652 in fiscal 1980, the committee is championing a further reduction in stipends to 300. In biomedical sciences, where support declined from 5,700 to 4,337 during the same time period, the committee recommends cutting this number further to 2,400 for the period 1982 to 1985. Only one program, the small joint Ph.D/M.D. program, was kept at its previous level, 725 positions, and two small programs, health research and nursing, which currently provide 88 and 108 stipends a year respectively, were recommended to be increased to 190 stipends in health research and 255 stipends in nursing.

The reports of the Committee on a Study of National Needs make extremely interesting reading because they illustrate the difficulties of diagnosing the supply and demand conditions for younger persons with doctorates. Members of the committee are aware of an imbalance, but are careful to be generous with their recommendations in order not to bring about shortages among highly skilled and qualified manpower. Nevertheless, their tone is becoming more cautious from report to report, and the amount of federal training support that they recommend decreases from report to report, especially in the biomedical sciences. A few years ago the committee recommended cut-backs in support to the behavioral sciences; it became increasingly impatient as these cut-backs were not implemented.

Research assistant support. There is much less ambivalence with respect to the role of research assistants. All committees, groups and reports that considered this topic are unanimous that stop-and-go funding is deleterious both to the institutions and to the ability of these institutions to train students. The American Association of Universities points out what it considers to be a dangerous trend -- the tendency to employ post-doctoral research staff at the expense of younger candidates. It urges federal agencies to encourage recipients of federal funds to use graduate students, but does not offer any specific provision to make this practice more prevalent.

While the concern for the involvement of the university in basic research is pervasive and recent commentaries on the future of this involvement have stressed the danger that current policies may be neglecting research in the basic sciences, the social sciences and the humanities, the links between the university's involvement in research and the support of pre-doctoral students have not been spelled out explicitly. Thus, a major part of the pre-doctoral support program -- stipends to students from federal research funds -- is not integrated with the main concerns for graduate support policies.

Too much borrowing? The earlier reports, e.g., the National Board and Carnegie, did not address the issue of excessive loan burdens on graduate students. At the time the final report of the Board was written, in 1974, borrowing by graduate students had not reached alarming levels. The Carnegie group was more concerned with equitable access to loans and did not discuss excessive loan burdens either. By 1978, the fifteen presidents recommended that the U.S. Office of Education study the problem. In 1983, the American Association of Universities viewed with alarm the increasing repayment commitments of students and called for a consideration of stretching or lightening repayment terms.

Some reasons for the lack of strong recommendations about graduate student support. One would expect a stronger consensus of different groups and a forceful policy on graduate student support, since graduate education is the linch-pin of most universities' activities. This consensus did not develop because persons with doctorates encountered increasing difficulty in finding suitable jobs.

The observations of the National Board on Graduate Education, published in 1972, are still valid:[47]

> A coherent, long-range policy toward student support, based on sound conceptual analysis and empirical analysis was (and is) still lacking. A sound policy must include the following efficiency considerations:
>
> 1) evidence regarding the presence or absence of social benefits of graduate education not captured by the individual student;
> 2) the effect on student choice of the pricing policies placed on graduate education by the university;
> 3) the implications for finance of the mobility of human beings, for the human capital created by investment in graduate education may not remain within the state that supports the training.
>
> In addition to efficiency considerations, a sound policy of student support must also reflect the following equity considerations:
>
> 1) access to graduate education by the underprivileged, minority groups, and women;
> 2) the regional distribution of graduate schools, with the implied impact on the regional economy and access by regional residents.

Past administrations and Congress have tacitly agreed with this position, and the majority of the programs for the support high rate of the 1960's and the early 1970's, an increasing number of doctorate recipients failed to obtain the type of positions they aspired to fill. The job prospects were especially bleak for persons with doctorates in the humanities, ninety per cent of whom traditionally found employment in college teaching. An imbalance between doctorate recipients and desirable jobs was also observed in some science disciplines, as physicists and mathematicians found it increasingly difficult to secure academic employment.[49]

The other area where doctorate recipients traditionally found jobs, research and development in either academic, government, or business settings, has also been saturated. More importantly, the National Science Foundation projections of expected levels of research and development for 1990 imply that the number of positions for doctorate recipients in this field is not likely to increase in the near future.[50]

There are still reported shortages of persons with doctorates in such fields as engineering and computer science. Private sector demand in these fields has remained fairly strong, and candidates for academic and research and development jobs are being bid away by the business sector. Since the majority of universities and research laboratories attempt to minimize the variation in wages for academics in different disciplines, a number of laissez-faire economists have argued that the shortages of computer scientists and engineers on university faculties is the direct result of overgenerous support of doctoral students in the past, which resulted in an overproduction of persons with doctorates. Had there not been surpluses in other disciplines, they argue, faculty wages would be higher and universities and laboratories would be able to compete with business.

In 1978, a Health, Education & Welfare advisory group predicted that this country may also be facing a surplus of physicians. A representative of the Association of American Dental Schools claimed that dentists were finding it increasingly hard to establish a practice, but blamed these difficulties on a depressed economy. The popular press has reported on a surplus of lawyers, and even the supply of registered nurses appears to have caught up with the demand.[51]

In January 1983, the Institute of Medicine released a report which concludes that there are likely to be continued opportunities for teaching jobs for nurses with graduate degrees and urges the federal government to continue supporting graduate nursing programs. If one agrees with this finding, graduate nursing programs are the exception to the rule.[52]

The conditions in the market-place have affected the level of production of doctorates. The total number of Ph.D. degrees granted appears to have stabilized at some 30,000 a year after a period of rapid growth in the 1960's and a peak of 34,000 degrees in 1975/76. The discipline mix of non-professional doctorate recipients appears to have changed somewhat as well, with some declines occurring in the surplus specialties in the sciences. Nevertheless, the shifts and the slight declines do not appear to have brought supply and demand in balance. It appears that both personal tastes and previous preparation affect students' choices of graduate programs.

Despite the preponderant weight of evidence, the expectation that the surpluses are temporary is still common among many academicians. A recent report of the faculty committee of the School of the Arts and Sciences at the University of Chicago rejected out-of-hand the projections of the National Center for Educational Statistics and decided that it was dangerous to trust forecasters. The faculty committee believed that quality graduate education should continuously be nurtured at leading universities, and made recommendations to the university administration to increase support to students.[53]

Other rationales for supporting graduate education?

During the past two budget cycles, Congress has protected a large number of graduate programs from the draconian cuts proposed by the Administration. It has done so without enunciating a rationale for its actions. There are many who believe that Congress has been doing the right things for no apparent reason, and that federal policy for student support could be made more effective and more rational if a new set of justifications for supporting graduate education were articulated.

Preserving the graduate establishment. The most obvious, and partially unspoken motivation of Congress in preserving the graduate student support programs is its fear of weakening the aid to over three-quarters of the existing doctorate departments.

It would appear that an alternative, selective reduction in the number of departments in all institutions may be a superior strategy. However, such cuts may not be easy to effectuate. A number of strong institutions have benefitted from their reputations, large endowments, or generous support from state legislatures to build up strength across the board. A recent ranking of leading departments in 32 disciplines in the arts, humanities, social, physical and life sciences showed the tremendous concentration of such departments. Out of a possible 320 entries, 11 schools garnered 184 mentions. Five were located in the East, three in the Midwest, and three in the West. Hardly any schools in the South, the Southwest, or the Mountain states ranked in the top ten.[56] A need for geographical balance would force some very difficult decisions if a national policy of selective retrenchment were adopted.

Such decisions would have to take into account not only some consideration of geographical balance, but also of the potential strength of the institution itself. As long as the lion's share of stipends comes from university funds, especially for teaching assistantships, the continuing ability of the institution to attract undergraduates will be very important, especially in a period of declining enrollments. For most institutions, graduate and professional education is extremely expensive. Much of the tuition of graduate students is remitted, and they require a disproportionate amount of time from the more expensive senior faculty. Furthermore, dissertation research needs to be supported with expensive apparatus for science/engineering students, and with elaborate library facilities for arts and humanities students. Ideally, a policy to preserve, selectively, the strength of graduate education needs to be integrated with a concern for financing higher education. Given the current organization of higher education, with much of the responsibility and burdens being shouldered by private and state resources, a mechanism for coordinating federal efforts with institutional sources should be high on an agenda for reform.

Meeting the aspirations of graduate and professional students. Academicians are sometimes shocked when either graduate or professional education is judged by the criteria of human investment theory, especially when this theory is crudely applied. The argument that only those courses of study should be subsidized which promise a high return to both the individual and society (with the return commonly measured in terms of expected earnings) does not sit well with the majority of academicians outside of economics.

They argue that the doctorate in the arts, humanities, or science/engineering was never a key to high-earning jobs. The majority of doctorate recipients settled for relatively low-paying jobs, either as teachers or as researchers. Many of them taught in schools with scant research facilities and, once their doctorate was completed, did not participate actively in original research.

Only a small minority of doctorate recipients in any generation make significant contributions to knowledge. The large number of well-trained persons who enter and persevere in graduate programs makes it possible for those with originality and high-order skills to show their true worth as innovators.

This humanistically-oriented point of view considers graduate education, as well as much of professional and undergraduate training, as an investment in human development, rather than a human investment. It places high value on the opportunity for self-fulfillment through a period of learning and independent research in a chosen field. It argues that subsidies to graduate students are no different from subsidies to budding artists or writers. All these groups need encouragement to continue the production of objects, books or theories which may not have commercial value, but nevertheless are desirable to society.

The extent to which these aspirations should be encouraged through generous subsidies is a purely political decision. The argument for keeping stipends at a high level can be easily countered: since fewer and fewer former graduate students are likely to attain a desirable life-style by obtaining academic or research jobs, it becomes increasingly controversial to encourage the persistence of these students in school. Hard-headed realists argue that subsidies are nothing more than bribes or inducements to engage in socially unproductive activities.

The two sets of positions outlined above are extreme, but sympathy for a more moderate version of one or the other belief does have serious policy implications. For instance, if the humanistic position is adopted, it would follow that more generous levels of stipends should be encouraged, possibly with federal financing. If the human investment position is favored, the current trend towards making students more aware of the costs of higher education by forcing them to borrow or finance an increasing proportion of their expenses for graduate school should be reinforced.

Is a synthesis possible?

In our pluralistic society, it is not necessary to come out with positions or policies which endorse precisely a given set of views of the world. A policy which would take into consideration opposing points of view is more likely to be successful. It has been argued above that the shortages in most graduate and professional specialties are behind us, and that a new rationale, and policy, ought to be formulated for the support of graduate and professional students. The country may be best served by recognizing the need to preserve a geographically diverse graduate establishment and strenthening its capacity in those areas of the country where it is currently weak, most notably the South and the Mountain States. The progress of the University of Texas in building strong departments makes attention to the Southwest less urgent.

Since the graduate establishment depends on a flow of graduate students, once the decision to protect the establishment has been made, it should be possible to formulate a reasonable program for student support. Concern for the universities would then prompt us to take a less directive attitude towards student support and extend the program of student fellowships and scholarships to students irrespective of field of study. Since shortages in the life sciences and the physical sciences are no longer apparent, it would make sense to stop favoring students in these disciplines.

The future of special programs for groups that are underrepresented among people with advanced degrees should be examined critically as part of this restructuring. Since advanced degrees no longer guarantee entry to traditional careers, special programs that are designed to facilitate access to such careers for students who are not prepared as well as other stipend receivers may fail to benefit the recipients as much as could be expected. A good argument could be made for shifting these moneys to enable ambitious, potential graduate students to enter quality undergraduate programs, where they would have access to special programs to make up for whatever deficiencies in preparation they had suffered previously.

Finally, the attention of both the Administration and Congress should be drawn to the large number of small programs sponsored by smaller agencies and departments to train specialists in areas of interest to these agencies. Many of these programs are ephemeral and tend to disappear in periods when budgets are tight, as they are today. Some protection for these programs should be provided in our budgeting and funding mechanism.

SOME PROS AND CONS FOR CHANGING THE SYSTEM OR KEEPING IT AS IT IS

The adoption of new, alternative rationales for the support of graduate students requires a re-examination of the suitability of present patterns of support to these students. In the following section, we shall discuss a series of alternatives from the points of view of policy-makers with different value-judgements: (1) those who believe that market forces should operate in the graduate sector, and that federal subsidies to students should be minimized, (2) those who are concerned with the preservation of the graduate establishment, (3) those who are worried about the welfare of students. As we indicated in the previous section, the interests of these last two groups overlap. When they do not overlap, differing points of view will be reflected in our discussion of arguments for graduate and professional student aid policy.

There are four major issues which need to be discussed in connection with student aid policy. Probably the most timely relates to the policy of financing an increasing proportion of student outlays with loans. Secondly, the number of available scholarships and traineeships needs to be re-examined. Thirdly, some attention should be paid to the levels of these grants. And last, some linkages should be established between research and development and policies for student support.

Scope of possible changes

In early 1983 there is no consensus about the policy which the federal government should adopt towards loans for graduate students. During the 1982/83 budget cycle, the Administration attempted to eliminate financing for graduate students from the Guaranteed Loan Program and was reported to be unsympathetic to other subsidized loans provided to students in medicine and nursing. Paradoxically, the aversion to heavy reliance on loans is shared by the more liberal segment of those who are concerned with graduate student financing, as they voice increasing concern that unrealistically heavy loan repayment obligations are being shouldered by both graduate and professional students.

Unfortunately, the agreement between these groups is extremely limited. While the Administration is concerned with the cost of subsidizing loans and would prefer students to borrow at higher, market rates, the liberal segment would like to reduce the reliance on loans by substituting either fellowship or other aid to students. At worst, they would be satisfied if interest rates and repayment schedules on loans were changed so as to reduce the burden of annual repayments on students.

Our estimates of current sources of support indicate that loans currently play an extremely important part in the financing of both graduate and professional students. Thus, replacing the loans with either fellowships or scholarships would require a major increase in the amount of federal scholarship support. If the amount of federal outlays for federal scholarships and fellowships was increased fivefold, it would only replace forty per cent of the borrowing by arts and science students. In the fields of medicine, nursing, dentistry and other health-related professions, a reversal of current policy would be required: instead of a shrinking program of scholarships, most of which carry a service commitment, a new program of fellowships and traineeships would have to be inaugurated. In such professional programs as law, where the federal role is limited to loans, new programs would have to be started.

The current controversy is centered around the federal role in providing subsidies for borrowing by both graduate and professional students. The lion's share of borrowing by both professional and arts and science students comes from the Guaranteed Student Loan Program. Graduate students can borrow up to $5,000 a year, and start paying nine per cent interest on the loans a year after graduation. The federal government pays for the in-school portion of the interest and, in addition, pays lending institutions a fee to subsidize the interest rate charged during the repayment period. In addition, the federal government is also responsible for the default on the loans.

Opponents of the lending program to graduate and professional students have argued that since there is no anticipated shortage of persons with advanced degrees, federal subsidies on loans to graduate students should be eliminated. Some have gone as far as to maintain that it is irresponsible to entice students to continue their education. Under circumstances when students will not be able to profit from additional schooling, they argue, many of the graduate and professional studies will lead to disappointment. Many students will also have trouble repaying the loans, they claim.

The proponents of subsidized lending argue that in ordinary, non-inflationary times, the cost of such a program is much less than one which would rely on outright grants, since it allows the government to reduce its subsidies to institutions considerably. They also argue that by introducing a lending program, the government is able to keep a lid on scholarship spending, while at the same time making the students aware of the costs of their education. They believe that in this way the balance between highly-trained persons and jobs will be gradually restored.

In 1980/81, a fifth of the outlays of students in graduate schools' programs was estimated to have been paid with the proceeds of loans, and the share of school tuition and student expenses to full-time professional students paid with loans may very well have reached a third. The proportion of students relying on loans varies by field. In the sciences/engineering fields, a minority of students, probably around 25 per cent, depend upon loans to provide their major support, and many others use loans to supplement their stipends. Medical students, by contrast, borrow more than the average post-baccalaureate student. Relying on the private sector to provide two billion of student loans without some government assistance is unrealistic.

Removing government subsidies for these loans appears as a less drastic policy than eliminating loan guarantees. The consequences of removing government subsidies need to be spelled out, and they are quite spectacular. If interest is compounded on the loan during the in-school period at a market rate of, say, 13 per cent, the amount borrowed the first year would escalate at the end of four years (the medical school course of study or full-time doctorate study) to 1.64 times the funds procured during the first year, 1.44 times the funds borrowed during the second year, 1.28 times the funds borrowed during the third year, and 1.13 times the funds borrowed during the last year. In summary, the repayment obligation of students who borrowed to finance a four-year course would amount to 1.33 times what it is with subsidized in-school repayment today. Students enrolled in three-year courses (such as dentistry or law) would have debts 1.28 times higher than under current circumstances.

We have little information about the distribution of borrowing, by amount borrowed, for graduate students. We do know that a small minority of students end up with high debts, especially those who attend high-cost private schools. Thus, the average debt of graduating physicians was estimated at $25,000 in 1981, and 68 per cent of graduating dentists had loans exceeding $25,000 in 1982. The repayment obligations of such students could easily exceed $3,000 a year, a considerable portion of their income, especially if they were employed in academic institutions as teachers or researchers. If the interest on the loans ceased to be subsidized, the repayment could increase by roughly one-third.

These amounts, even in the case of currently subsidized loans, are a considerable share of the starting salaries of most young Ph.D.'s. In 1981, the median salary of humanists less than five years after their doctorate was $20,400 for those employed full-time. For all science/engineering Ph.D.'s with the same level of experience, it was $26,600. (Social scientists, a subset of science doctorates, had median incomes of $24,300.) These estimates, calculated by the National Research Council, may be on the high side, since they assume that all persons with doctorates employed by academic institutions receive an additional 18 per cent of their pay for summer employment. In either case, repayments of $3,000 or more per year may be a substantial burden, especially for Ph.D. recipients with earnings below the median.[57]

The most often mentioned proposal for reducing the burden of repayment is to forgive repayment of interest and principal to borrowers under the guaranteed student loan program who enter teaching or research careers, as was done in the National Defense Education Act. While it was easy to justify such provisions in the past, when teaching and research jobs paid considerably less than jobs in industry, this is no longer the case. According to the National Research Council, humanities graduates are likely to be paid less if they are employed by non-academic employers, compared to those who land academic jobs. Under these circumstances,the unfortunate doctoral recipients who do not manage to get interim appointments to teach or do research may be even more deserving of loan forgiveness than the others.

We hesitate to suggest that graduate loan programs be converted to income-contingent loans. The pros and cons of these types of loans are extremely complex. Suffice it to say here that in the present employment climate, the cost of income-contingent loans to the lender cannot be estimated. With much uncertainty clouding the level of future incomes of persons with graduate degrees, realistic projections of the suitable rates of repayment cannot be made.

In summary, loans are an extremely popular way of financing graduate education. Perhaps somewhat too popular, as repayment burdens may become increasingly onerous, especially for students in the arts and humanities, who have to rely on loans most, and whose earning prospects are not brilliant. Whether borrowing would be discouraged by ending federal payment of in-school interest and subsidies to the interest rate during repayment is not clear. Even if overall lending is reduced, it is quite likely that a small minority of arts and sciences graduate students would start their careers with higher debt repayment obligations, as would a large majority of lawyers, doctors and dentists. In the case of professionals, such as doctors, who may set fees in such a way as to earn a pre-determined sum, higher repayment obligations may well be passed on to consumers. Others who have less control over the level of their incomes will either bear the burden of repayment themsleves or share it with their families.

The number of fellowships and traineeships and their targeting. Our review of the history of the federal program for support of students in graduate schools and the professions revealed that the lion's share of this support was provided in response to perceived shortages of highly trained personnel in the sciences, mostly physical and life sciences, in some health professions, and in specific occupations of interest to a variety of agencies, e.g., teachers of the handicapped. Just as these programs grew in response to perceived shortages, they shrank and were cut once these shortages were no longer believed to be imminent. Different agencies reduced their programs depending upon the overall levels of their budgets.

A key issue facing policy-makers today is whether the fellowship and traineeship programs should remain at the present level, be increased, or be decreased. The most potent argument for keeping the current levels of support is that they have resulted in stable enrollments in schools of arts and sciences. It is true that students in these schools have increasingly supplemented their stipends with work on research projects, income from teaching assistantships, or loans. Nevertheless, it does appear that the "package" derived from these sources is satisfactory enough for a large number of students to continue attending graduate school. In the case of professional students, there are indications that applications to medical schools are declining, but still exceed the capacity of these schools by a factor of two, so admission to these schools is severely rationed. In other health-related professions, the demand of applicants for places in schools of dentisty and nursing appears to be weakening, according to officials of associations of these schools, but there is no evidence, yet, that these schools are unable to fill their classrooms. While it is difficult to make generalizations about schools of law, there is no doubt that prestige institutions, both public and private, which provide rigorous training to their students are still able to pick and choose among applicants.

We have sketched above the patterns of current support to graduate students, and have stressed that much of that support comes from institutional sources. In the next few years, we contend, these sources will be diminished. For instance, the number of teaching assistantships could decline in proportion to the projected declines in undergraduate enrollment, and their number could be reduced by as much as 20 per cent.

The number of research assistantships is likely to decrease, as cost-cutting pressures on universities put a damper on research financed out of university funds. If the National Science Foundation projections of total research and development are correct, this decline will not be offset by higher outlays, either by the government or by private sources.

The possibility that school-financed sources of stipends for graduate students may be severely reduced raises the issue of whether the federal government should increase its commitment to these students. If the current size of the graduate establishment is to be maintained without placing any further burden on students for additional self-financing, it may be necessary to increase the federal share and to fund as much as 20 per cent of the moneys presently received through teaching assistantships, as well as possibly a third of the research assistantships presently financed by universities. The amounts of additional aid required to offset such potential reductions in research and teaching assistantships would amount to $300 million in 1980/81, more than the total amount spent by the federal government on all fellowships and traineeships.

If such a major increase in student support is contemplated, it would be well to consider whether it should be directed through conventional channels, with different agencies determining eligibility for fellowships and traineeships, or whether a new, consolidated program which would equalize the available funding between science/engineering students and those in the arts, humanities and fields such as education should be inaugurated. As long as there is no likelihood of national shortages in any specialty, it would appear reasonable to allow students to choose their own majors and have the federal government give equal subsidies to the cream of the crop in every discipline.

From a political point of view, there would be some definite advantages and disadvantages to such an arrangement. Centralizing all student support would allow reasonable value judgements about its levels. It would also enable the Administration and Congress to track the effect of such support not only on the supply of highly educated persons, but also on institutions. On the other hand, concentrating all student support money in a single fund managed by a single agency would make it more vulnerable to cuts. The current dispersion of the money throughout departments or agencies can protect certain appropriations because of their close links to powerful constituencies. In the final analysis, these considerations are likely to determine the strategy for graduate student financial assistance.

In the professional field, especially in the health professions, a more fundamental re-examination of levels of aid is needed. Traditionally, the amount of aid to students in the health professions and law has constituted only a minute proportion of these students' budgets. As long as graduates with professional degrees were assured of relatively high levels of income, it was felt that they could finance their education either with loans that they could repay easily once they were established, or with parental or spouse support. Now that the earning prospects in a number of these professions are no longer considered so bright, a re-evaluation of this policy may be in order. Unfortunately, firm targets for desirable levels of support cannot even be guessed at with the present lack of knowledge about either the future finances of professional schools or the potential resources of their students and the applicant pool. However, we would be remiss not to mention that a large number of medical schools in the United States are currently major centers of research in the health sciences and can no longer be regarded merely as training grounds for physicians. Supporting the activity of these medical schools is therefore part and parcel of preserving the nation's research capability.

The level of stipends for students

A good argument can be made that the level of current stipends for graduate students is no longer adequate. This level has generally been set at some minimum necessary to keep body and soul together. Currently it is below this level, forcing a vast majority of students to work part-time, draw on their spouses' resources or their savings, or tap the loan market. In the past, when education beyond the baccalaureate assured either a desirable research or teaching career or high wages in a high-prestige occupation, it could be considered reasonable to require students to make sacrifices which would be offset by future benefits. Under present circumstances, an argument can be made that the benefits to these students will be minimal, and at best intangible. The real benefits will accrue to the institutions which they attend and to the segment of our society which is concerned with the advancement of knowledge. Under these circumstances, the students should be paid a living wage.

Stipend levels in the majority of science/engineering programs currently amount to some $6,900 per student plus a contribution in lieu of tuition to the school. These stipends reasonably could be increased to some $12,000, about 80 per cent of the wages which college graduates could command if they sought full-time employment. The increase in stipends would recognize the graduate students' contribution to the functioning of the university, as well as the probability that they will get slim economic benefits from participating in these programs.

Tying the fellowship and traineeship programs to the research agenda. The short-term priorities which shape the federal government's research agenda have resulted in the ebb and flow of funds for research from one discipline to another. As a result of these changes in the level of funding, graduate students in various disciplines have been exposed to uncertainty about the level of stipends available from research assistantships.

In the late 1960's and 1970's, concern for understanding the causes of poverty contributed to strenghtening research in labor economics and sociology. This support is waning. Today's priority, enhancing the strength of the U.S. defense establishment, is shifting research funds from fields such as energy, environment and education to defense. This has resulted in less money for basic research and more for applied aspects even in the hard sciences.

No central mechanism exists to plan for basic research except in the sciences, where long-term opportunities in the biological aspects of medical science are closely monitored by study groups at the National Institutes of Health. Despite its limited program, even the National Science Foundation is increasingly being fractured to consider problems in such areas as oceanography, rather than focus on broader theoretical issues in the sciences. There is no mechanism for anticipating the level of resources that would be required to make major advances in either the social sciences or the humanities.

Anticipating such needs and making fundamental decisions about the federal government's share in shouldering the necessary expenses will take some serious thought. There is a consensus that the universities' resources will shrink, and that the currently important role which these institutions play in subsidizing fundamental research will also decline. As long as apprenticeship in research is such an important part of the graduate process, the opportunity to participate in fundamental research, especially in the sciences, is an important ingredient in preparing a new generation of scientists who are capable of advancing knowledge. Serious consideration should be given to establishig a new category of research traineeships to support fundamental, basic research.

Some price-tags on possible programs for the support for graduate students.

Instead of a summary and recommendations, we present price-tags for a variety of possible changes in graduate support.

It is relatively easy to set a price-tag on reducing programs which are already in place. In the past fiscal year, fellowships and traineeship programs for graduate schools amounted to some $200 million. Cutting them in half would save

$100 million, and eliminating them would save $200 million. Federal scholarship programs for professional students were already cut $40 million from their 1980/81 level when the Public Health Service Traineeships for medical students were eliminated; another $80 million could be saved by cutting them out completely, and $40 million by cutting them into half.

Eliminating Guaranteed Student Loans and National Direct Education Loans to graduate and professional students would save some $80 million in the GSL program the first year and an indeterminate amount every year thereafter, as well as close to $80 million from the NDSL program. Reducing the amount borrowed by graduate students by lowering their eligibility ceilings to the same $2,500 as is available to undergraduates would probably result in saving about one-third of the of the subsidies for the GSL program.

If an increase in the number of fellowships or traineeships is desired, a number of targets could be adopted:

Graduate students: (1) Increase the number of fellowships and traineeships and stipends so as to raise the proportion of graduate student budgets covered by this source to the 1965 level. The incremental cost of this program, 10 per cent of graduate student budgets, would amount to $500 million, i.e., a tripling of current expenses.

(2) Increase the number of fellowships in the social equal the same fraction of the budget as the stipends to students in the hard sciences. This would cost (a) $180

million in the social sciences, (b) roughly $0.8 billion for other fields.

Professional students: Establish new professional student fellowships to cover the 10 per cent student budgets in professional schools, equal to the contribution of fellowships to students in graduate schools; this would cost some $200 million. If the share of fellowships and traineeships in student budgets for professional students were to be brought up to 20 per cent of budget, the total cost would amount to $475 million.

Increasing stipends to students. An increase of stipends to students from current levels ($6,900 for the National Science Foundation and $5,800 for other agencies) to $12,000 would roughly double the cost of any of the programs outlined in the above menu.

Establishing a new program for research assistants for basic research projects. If 20 per cent of the research assistants who currently work on faculty-sponsored research were to be supported through federal stipends, another 6,800 fellowships would have to be established. The cost of the fellowships, with perhaps $6,900 going to the student and the usual $4,000 institution allowance, would be $74 million. This program could have a high priority if other fellowship programs are not increased.

Towards an adequate or generous post-baccalaureate support program.

In the best of all possible words, it would make sense to have an adequate or generous post-baccalaureate program which would cover about 50 per cent of these students' budgets through stipends. We estimated that the minimum budgets of graduate students amounted to aminium of $5.2 billion in 1982/83. Of this amount, as much as $1.2 billion could be provided from institutional and other funds. An additional $530 million could be expected to be contributed by federal funds. To reach this $2.6 billion goal would require close to a billion dollars more than present resources.

The following package of programs would meet the goal:

(1) Introduce a wide-ranging program of fellowships and traineeships which would pay $6,000 to each student and provide for a $4,000 institutional allowance.

(2) Establish a new research assistant program for some 6,800 fellows with a $4,000 institutional allowance for $74 million; provide a special program for students in the social sciences, $180 million; earmark $1.0 billion for students in business, nursing, arts, humanities and other graduate programs; and allocate some $500 million to medical, dental, other first professional health, and miscellaneous programs. Retain the current program of fellowships and traineeships.

The above initiatives would eliminate most subsidized loans for both graduate and professional students. A small health professions loan program for students attending high-cost schools would still be necessary.

CONCLUSION

Generous programs for graduate and professional students would require some additional $2.0 billion. Decisions to decrease, keep level, or increase these subsidies will have to be made on the basis of judgements about the value of the graduate and professional school establishment to our society, and, even more importantly, the extent to which we want to encourage the production of highly-trained persons and professionals.

FOOTNOTES

[1] Martin M. Frankel and Debra E. Gerald, *Projections of Education Statistics to 1990-91, Volume I: Analytical Report*, Washington, D.C., U.S. Department of Education, National Center for Education Statistics: March 1982, Tables 12A, 12B, 13A and 13B, pp. 53-57.

[2] "Results of Council of Graduate Schools - Graduate Record Examinations Board 1982-83 Survey of Graduate Enrollment, Part I,", Washington, D.C., The Council of Graduate Schools in the United States: 1982 (mimeographed).

[3] Statistics of graduate degree credit students were collected as part of the Fall Enrollment in Higher Education Survey by the National Center of Education Statistics. This survey, which is no longer published by the Government Printing Office, was shortened in 1981 and this statistic is no longer collected.

[4] "Enrollment of Summer Students Rise 7.5 Pct. in 1981," *Chronicle of Higher Education*, November 24, 1982, p. 6.

[5] Association of American Medical Colleges, "1982-83 Medical School Enrollment," Washington, D.C., n.d. (mimeographed).

[6] The two-course average remains amazingly steady for students with B.A. degrees attending colleges and universities in U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, *Participation in Adult Education* for 1969, 1972, 1975 and 1981, Washington, D.C., U.S. Government Printing Office, 1974, 1976, 1978 and unpublished tabulations. The first three surveys were distributed by the Government Printing Office. The survey for 1978 has not been fully tabulated. Limited tabulations of the 1981 survey are available from the National Center for Education Statistics.

[7] James A. Davis , *et al*, *Stipends and Spouses, The Finances of American Arts and Science Graduate Students*, Chicago and London, The University of Chicago Press: 1962.

Seymour Warkov, *et al*, *Graduate Student Finance, 1963. A Survey of Thirty-Seven Fields of Study*, Chicago, Illinois, National Opinion Research Center: September 1965.

J. Scott Hunter, *The Academic and Financial Status of Graduate Students, Spring 1965*, Washington, D.C., U.S. Department of Health, Education and Welfare, Office of Education, U.S. Government Printing Office: 1967.

[8] Herbert J. Flamer and Dwight H. Horch, *Talented and Needy Graduate and Professional Students, A National Survey of People Who Applied for Need-Based Financial Aid to Attend*

Graduate or Professional School in 1980-81, Supplementary Appendix Tables, Princeton, N.J., Educational Testing Service: April 1972.

[9] Average tuition for universities for 1980/81 from W. Vance Grant and Leo J. Eiden, Digest of Educational Statistics, 1982, Washington, D.C., U.S. Department of Education, National Center for Education Statistics, n.d. Tuition for 1981/82 and 1982/83 was estimated based on unpublished data collected by the College Entrance Examination Board. Cost of living was inflated by the Consumer Price Index changes September to September in each year. A convenient source to obtain this statistic is the Monthly Labor Review.

[10] Unpublished tabulations, see footnote 6.

[11] The two National Opinion Research Studies are fully cited in footnote 7.

[12] J. Scott Hunter, op. cit., Table 11, pp. 22-23.

[13] National Science Foundation, OPRM/Division of Budget and Program Analysis, Analysis of Budget Trends, June 1982 (processed) and program information.

[14] Peter D. Syverson, Summary Report 1981, Doctorate Recipients from United States Universities, Washington, D.C., Office of Scientific and Engineering Personnel, National Research Council, National Academy Press: 1982, Text Table C, pp. 13-14.

[15] Academic Science, Graduate Enrollment and Support, Fall 1980, Washington, D.C., NSF 80-321, also unpublished tabulations for the Fall 1982 report, see especially Table B-10, The Council of Graduate Schools in the United States, Report on the Council of Graduate Schools-Graduate Record Examination Board 1982-83 Survey of Graduate Enrollment, Princeton, N.J., Graduate Record Examination Board (processed), also see CGS Communication Special Report Vol. XV, No. 11, December 1982.

The proportion of graduate student support financed by grants was derived from J. R. Endriss, N.S.F. Survey of Academic Impact Data, Washington, D.C., The Evaluation Staff, National Science Foundation: June 1974. It was calculated as follows:

PROPORTION OF RESEARCH AND DEVELOPMENT
SPENT ON GRADUATE STUDENT STIPENDS

	Per cent		Per cent
Agriculture	17.5	Transportion	8.7
Commerce	12.4	Energy (EPA)	7.5
Defense	13.2	NSF	8.3
NIH	5.2	Ave	7.2
Interior	15.5	Others	7.2E
NASA	14.5		

These proportions were multiplied by Research and Development Funds reported in *Federal Support to Universities* ..... *op. cit.*, Table B-2.

[16] 11th Edition, New York, N.Y., The Foundation Center: 1982.

[17] American Association of Medical Schools, "Tabulations of Survey of American Medical Schools," n.d. (processed)

[18] *Survey of Dental Seniors, Summary Report 1982*, Washington, D.C., American Association of Dental Schools: November 1982, p. 8.

[19] A number of reports by the Student Support Group of the Federal Interagency Committee on Education addressed the erosion of student support by the federal government: *A Study of Predoctoral Student Support*, (November 1968), *Report on Federal Predoctoral Student Support*, Parts I and II (1970), and *Federal Policy and Graduate Education*, (June 1975). All these reports were processed by the Committee.

[20] Unpublished tabulations of the Federal Interagency Committee, Cf. *Report*, cited in footnote 19.

[21] See Appendix I.

[22] Syverson, *loc cit*

[23] Program Information, ADAMHA.

[24] See footnote 13.

[25] Cf. *Report on Federal Predoctoral Support, Part I Fellowships and Traineeships*, Federal Interagency Committee on Education, Student Support Study Group, April 1970 (processed), Appendix D.

[26] *Ibid*, and program information.

[27] Cf. *Report on Federal Predoctoral*...., *ibid*.

[28] Stipends from the Veterans' Administration were calculated as follows:

1) The Survey of Income and Education, a large survey of the population surveyed in 1976, was used to determine the number of full and part-time graduate students who reported receiving benefits from the Veterans' Administration.

2) Mean amounts paid was obtained from a Veterans' Administration program officer for each category of student.

3) The number of students was multiplied by the mean amount to obtain the estimate for 1979.

4) For subsequent years, it was assumed that the same proportion of educational assistance would benefit graduate and professional students.

5) Educational assistance for 1975-1981 was obtained from the *Annual Report, 1981, Veterans' Administration*, and for 1982 from the Agency.

6) Reported totals from the Veterans' Administration, below, are from *The Special Analyses, Budget of the United States*, *op. cit.*, Table 11.

VETERANS' BENEFITS TO GRADUATE AND PROFESSIONAL STUDENTS
(millions of dollars)

	Total	Full-Time	Part-Time
1975	400	262	55
1976	495	404	68
Trans Quat	68	56	9
1977	289	228	40
1978	239	195	33
1979	207	169	28
1980	n.a.	141	23
1981	n.a.	135	22
1982	n.a.	100	16

[29] Veterans' Administration program information.

[30] Unpublished tabulations, National Science Foundation. These tabulations will be part of the annual report, *Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal 1981* to be published by the Foundation later this year.

[31] *Compilations of Aid to Medical Students*, Association of American Medical Schools, (processed).

[32] *Ibid*.

[33] *Medical School Graduation Questionnaire Survey, 1982, Summary Report for All Schools*, Association of American Medical Colleges, Question 36, p. 20 (processed).

[34] Sources cited in footnote 19. Also program information, NSF, NIH, and ADAMHA.

[35] Office of Planning and Policy Studies, *Graduate Support and Manpower Resources in Graduate Science Education*, Washington, D.C., National Science Foundation, June 1968 and June 1971. Also footnote 30.

[36] Announcement by Department of Defense (no date). These fellowships are administered by the Services' Research Office, Research Triangle Park, N.C.

[37] Susan Saiter, "Natural Scientists Gain, Social Scientists Lose," *The New York Times*, *Fall Survey of Education*, November 14, 1982, p. 42.

[38] Kenneth R. Reeber and James S. Davis, *14th Annual Survey, 1982-83 Academic Year*, Harrisburg, Pennsylvania, National Association of State Scholarship and Grant Programs: n.d., pp. 9-13. Between 1981/82 and 1982/83, the amounts grew by 4.4 per cent only.

[39] For trends in private support, see *Voluntary Support of Education, 1980/81*, New York, New York, Council for Financial Aid to Education: March 1982.

[40] The total Research and Development funds from industry are projected to grow between three and five per cent a year. This is not likely to provide significant growth in employment. *1990 R&D Funding Projections*, Washington, D.C., National Science Foundation, Special Report 82-315, pp. 9, 17.

[41] See footnote 6.

[42] See footnote 6.

[43] See Table 11 for this and the figures which follow.

[44] Syverson, *ibid*.

[45] John D. Millet, "Who Should Pay for Graduate Education?", *Management Forum*, Washington, D.C., Academy for Educational Development, Vol. 1, Supplement, December 1972, p. 1.

[46] *Graduate Education: Purposes, Problems and Potential*, Washington, D.C., National Board on Graduate Education: November 1972.

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[47] Graduate Education: Purposes, Problems and Potential, op. cit., p. 11.

[48] See Joseph Froomkin, "Full-time Faculty in Higher Education, Numbers and Ages," 1978 Proceedings of the Social Statistics Section, Washington, D.C., American Statistical Association: n.d., pp. 657-661.

William G. Bowen, Report of the President, April 1981, Graduate Education in the Arts and Sciences: Prospects for the Future, Princeton, N.J., Princeton University: n.d., p. 19.

Charlotte V. Kuh and Roy Radner, Preserving a Lost Generation: Policies to Assure a Steady Flow of Young Scholars Until the Year 2000, Berkeley, California, Carnegie Council on Policy Studies in Higher Education: 1978.

[49] Betty D. Maxfield, Science, Engineering and Humanities Doctorates in the United States, 1981 Profile, Washington, D.C., Office of Scientific and Engineering Personnel, National Research Council, National Academy Press: 1982, pp. 19 and 49. The proportion of doctoral scientists working outside their field is increasing from one year to the next.

[50] The compound rate of growth for all sectors was projected to be between 3 and 4 per cent. Federal and university research and development was projected to grow at 2 per cent. Private sector growth at 4 or 5 per cent a year. If real wages rise at 2.5 to 3.0 per cent, the number of persons engaged in research and development will not grow, 1990 R&D Funding..., op. cit., p. 1.

[51] A surplus of medical doctors in most specialties was forecast by The Report of the Graduate Medical Education Advisory Committee to the Secretary, Department of Health and Human Services, Volume I, Summary, Health Resources Administration, Office of Graduate Medical Education, Publication (HRA) 81-651, 1981.

[52] Division of Heath Care Services, Institute of Medicine, Nursing and Nursing Education: Public Policies and Private Actions, Washington, D.C.: National Academcy Press, 1983, Chapter 2.

[53] "Report of the Commission on Graduate Education," The University of Chicago Record, Vol. XVI, Number 2 (May 3, 1982), pp. 67 ff.

[54] William G. Bowen, op. cit., pp. 28-30.

[55] Federal Support to Universities..., op. cit., Table B-4, p. 22, Table D-26, p. 56.

[56] "Ranking of Universities' Reputations and Numbers of Faculty Publications," The New York Times, January 17, 1983, p. B7. This a summary of a study published by the Conference Board of Associated Research Councils.

[57] Betty D. Maxwell, op. cit., pp. 25, 54.

TABLE 1

GRADUATE AND FIRST PROFESSIONAL ENROLLMENT FALL 1970-1981
(thousands of students)

	Graduate			First Professional	
	Total	Degree-Credit	Full-Time	Total	Full-Time
1970	1,031	816	379	175	155
1971	1,012	836	328	194	173
1972	1,066	858	394	207	184
1973	1,123	908	410	218	192
1974	1,190	965	427	236	206
1975	1,268	1,053	453	245	213
1976	1,333	1,089	463	251	219
1977	1,318	1,090	472	251	225
1978	1,319	1,085	462	257	226
1979	1,300	1,074	476	263	233
1980	1,343	1,105	489	278	239
1981	1,343	n.a.	446	275	248

Source: National Center for Educational Statistics.

TABLE 2

COLLEGE GRADUATES ENROLLED IN PART-YEAR OR PART-TIME PROGRAMS
(thousands of students)

	FALL ENROLLMENT SURVEY	ADULT EDUCATION SURVEY	
		TOTAL	COLLEGES AND UNIVERSITIES
1969	593	2,831	1,595
1972	671	4,383	2,613
1975	810	3,285	3,285
1978	882	n.a.	n.a.
1981	933	6,660	3,663

n.a. not available.

Source: Surveys of Participation in Adult Education, National Center for Educational Statistics.

TABLE 3

GRADUATE FULL-TIME AND PART-TIME DEGREE-CREDIT ENROLLMENT BY DISCIPLINE AREA, CALENDAR 1980
(number of students)

	Full-Time	Part-Time
Physical Science	50,130	18,856
Engineering	43,578	33,596
Life Science	72,404	30,927
Psychology	26,636	13,908
Social Science	56,363	36,812
Total Science/Engineering	249,111	134,099
Others	236,000	724,000
Total	485,000	858,099

Source: Academic Science, Graduate Enrollment and Support Fall 1980, NSF 81-330; Government Printing Office, Washington, D.C. Table A-1.
Projections . . . to 1990/91, ibid.

TABLE 4

ESTIMATED OUTLAYS OF GRADUATE AND PROFESSIONAL STUDENTS
(dollars per student)

	1979/80 Per Student	1980/81 Per Student	1981/82 Per Student	1982/83 Per Student
Full-time Graduate				
Tuition	$2,069	$2,497	$2,759	$3,000
Other costs	5,769	6,398	7,070	7,812
Totals	$7,836	$8,895	$9,829	$10,812
Full-time Professional				
Tuition	$3,515	$4,242	$4,686	$5,096
Other costs	5,709	6,331	6,996	7,346
Totals	$9,224	$10,573	$11,682	$12,442
Part-time Students				
Tuition		$470	$517	$569

Source: 1979/80 Adopted from Herbert J. Flamer and Dwight H. Horch, Talented and Needy Professional Students: A National Survey of People Who Applied for Need-Based Financial Aid to Attend Graduate and Professional School in 1980/81, Supplementary Appendix Tables, T5.2, 5.3, 5.4, 5.5, 5.6 Educational Testing Service, Princeton, New Jersey 1982. For 1981/82 and 1982/83 see text.

TABLE 5

COST OF ATTENDANCE OF FULL-TIME STUDENTS IN UNIVERSITIES

	Total Tuition, Board & Room Universities	Tuition & Required Fees Universities	CPI
1964/65			
Public	795	291	29.9
Private	1,297	905	
1969/70			
Public	936	324	116.3
Private	1,533	1,111	
1974/75			
Public	1,935	599	161.2
Private			
1979/80			
Public	2,487	840	247.0
Private	5,888	3,811	
1980/81			
Public	2,711	915	272.3
Private			
1981/82			
Public	3,049	1,041	292.2
Private	7,491	4,900	

Source: Tuition, board and room: National Center for Educational Statistics.
CPI: U.S. Department of Labor. 1982 CPI is for July 1982.

TABLE 6

FULL-TIME SCIENCE/ENGINEERING GRADUATE STUDENTS BY MAJOR SOURCE OF SUPPORT, 1974-77 AND 1979-81

(thousands of students)

	1974	1975	1976	1977	1979	1980	1981
Federal							
Doctorate	48	48	50	51	53	53	51
Other	n.a.	n.a.	2	2	2	18	18
Total	n.a.	n.a.	52	53	55	71	69
Institutional							
Doctorate	75	77	79	81	83	87	90
Other	n.a.	n.a.	3	3	4	4	4
Total	n.a.	n.a.	82	84	87	91	94
Other U.S.							
Doctorate	12	11	11	11	12	13	14
Other	n.a.	n.a.	1	1	1	*	*
Total	n.a.	n.a.	12	12	13	13	14
Self-Support							
Doctorate	56	68	69	68	68	70	71
Other	n.a.	n.a.	10	11	13	12	13
Total	n.a.	n.a.	79	79	81	82	84
Total Students							
Doctorate	195	210	214	218	224	223	231
Other	n.a.	n.a.	16	17	19	16	18
Total	n.a.	n.a.	230	235	243	239	249

* less than one thousand

Source: Academic Science, Graduate Enrollment and Support, Fall 1979, National Science Foundation NSF 80-321, Table B-25, 1-5, C-10, C-11, C-12.
Academic Science, Graduate Enrollment and Support, Fall 1981, National Science Foundation (in press), Table B-13, C-26.

TABLE 7

PRIMARY SOURCE OF SUPPORT AND ALL SOURCES OF SUPPORT REPORTED BY DOCTORATE RECIPIENTS
(per cent of recipients)

	Per Cent Reporting Primary Source of Support (mean 78-81)	Per Cent Reporting Some Support During Ph.D. Program	Ratio
Federal	7.3	21.1	.35
National Fellow	1.1	2.9	.38
University Fellow	6.0	19.2	.31
Teaching Assistantship	19.0	45.9	.41
Research Assistant	17.6	36.9	.38
Education Funds by Industry	.9	3.1	.29
Self-Support	32.2	84.0	.38
Family	2.0	16.9	.11
Loans	1.4	11.2	.13

Source: Peter D. Syverson, Summary Report 1981, Doctorate Recipients from United States, Universities, Office of Scientific and Engineering Personnel, National Research Council, National Academy Press, 1982, Tables C and 3, pp. 13-14, 38.

TABLE 8

ESTIMATED SUPPORT OF GRADUATE STUDENTS BY DISCIPLINE 1980/81 (millions of dollars)

	Federal	School	Other	Total	Dollars Per Full-Time Student	Average Stipend as Per Cent of Average Expenses
Physical Sciences	107.4	203.0	17.4	327.8	6,538	73
Engineering	93.8	103.7	33.1	230.6	5,291	59
Life Sciences	204.2	196.1	26.8	427.1	5,899	66
Social Sciences	69.0	211.4	24.4	305.2	3,677	41
Others	56.4	336.1	24.4	416.9	1,766	20
All Disciplines	530.8	1050.3	126.5	1707.6	3,594	40

Source: See Appendix 1.

TABLE 9

ALTERNATIVE ESTIMATES OF SUPPORT OF GRADUATE STUDENTS
(millions of dollars)

FEDERAL	
Science and Engineering support reported to NSF	214.9
Less support for postdoctorals	71.7
Pre doctoral support	143.2
Nursing fellowships	
U.S. Dept. of Education	45.0
Other small grants	3.5
Subtotal	205.6
Research assistantships supported by federal sources	346.0
	551.6
Veterans' payments	115.0

SCHOOL	
Tuition remission	416.0
Research assistantships	34.0
Teaching assistantships	444.5
	914.5
OTHER	
Fellowships	22.0-45.0
Research Assistantships	77.0-96.0
	99.0-136.0
Total	1678.1-1725.1

Source: See text.

TABLE 10

ESTIMATED SUPPORT FOR FIRST PROFESSIONAL STUDENTS, 1980/81

(millions of dollars)

	Medicine	Dental	Law	Others	Total
Loans					
GSL	195.6	40.0E	209.6	108.2	553.4
NDSL	16.6)	5.7	24.1)	13.9)	60.3
Other govt.	39.2)		-)	1.5)	40.7
Other	19.8	9.1	8.1	24.7	61.7
	271.2	54.8	241.8	148.3	716.1
CWS	1.5	.5E	11.9	5.1	19.0
Scholarships					
Federal	108.6	3.0	-	9.9	121.5
School	23.8	5.0	24.5	13.5	66.8
Other	8.4	1.4	9.0	4.7	23.5
	140.9	9.4	33.5	28.1	211.8
Total	413.4	64.7	288.2	181.5	903.9
Students (thousands)	65.2	22.8	100.4	63.6	251.0
Average per student (dollars)	6,340	2,837	2,870	2,850	3,601
Average budget	12,128	9,917	9,917	9,917	10,469
Per cent loan to budget	34	24	24	24	27
Percent scholarships to budget	18	4	3	4	8
Other	48	72	73	72	65

Source: Association of Medical Schools, inflated by 1.033 by proportion of enrollment of non-reporting schools (mimeo). 1981/82 Annual Report, Dental Education, Division of Educational Measurements, Council on Dental Education, American Dental Association, Chicago, Illinois, N.D., Tables 12, 13. American Bar Association (mimeo).

TABLE 11

AMOUNTS AND SHARES OF BUDGETS OF FULL-TIME GRADUATE STUDENTS COVERED BY STIPENDS IN 1980/81 AND 1965

	1980/81		1965	
	Millions of Dollars	Percent of Budget	Millions of Dollars	Percent of Budget
Stipends				
Fellowships, etc.	434.7	9.2-10.1	145.4	23.9
Research Assistantships	627.7	13.2-14.6	60.7	9.1
Teaching Assistantships	642.8	13.5-14.9	75.4	11.3
	1705.2	35.9-39.5	281.5	42.2
Loans				
GSL	987.0	20.8-22.9	-	-
NDSL	107.0	2.3- 2.5	-	n.a.
Other govt.	21.0	.4- .5	-	n.a.
Subtotal	1115.0	23.5-25.8	23.7	3.5
	2820.2	59.4-65.4	305.2	45.7
Work-Study	27.3	.6- .6		
Self-Support	1466.5) 1897.5)	40.0-34.0	359.6	54.3

Source: 1980/81: Tables 4 and 7.
1965: S. Scott Hunter, The Academic and Financial Status of Graduate Students, Spring 1975, U.S. Department of H.E.W., Office of Education, U.S. Government Printing Office, Washington, D.C.: 1967, Table 11.

TABLE 12

U.S. BUDGET BUREAU REPORTED SUPPORT FOR GRADUATE AND PROFESSIONAL POST-BACCALAUREATE STUDENTS, 1970-79

	1970	1971	1972	1973	1974	1975	1976	1976	1977	1978	1979
Office of Education	n.a.	n.a.	49	36	90	165	159	41	114	124	115
Health Agencies[1]	n.a.	n.a.	207	93	89	125	112	27	86	105	118
Other Health Education & Welfare	n.a.	n.a.	70	137	113	184	169	52	136	146	135
Total H.E.W.	257	380	326	266	292	474	439	120	336	375	368
Veterans' Administration	126	183	190	300	317	400	495	68	289	239	207
National Science Foundation	34	34	30	20	16	11	19	2	16	13	14
Defense					83	340	117	36	165	158	160
Others	16	11	15	18	15	14	9	3	7	6	5
Total	433	608	561	604	723	1,239	1,079	229	811	791	754

[1] NIH only since 1973

n.a. not available

Source: U.S. Bureau of the Budget, Special Analyses, Budget of the United States Government, "Education", 1970-1979

TABLE 13

FEDERAL OBLIGATIONS TO UNIVERSITIES AND COLLEGES FOR FELLOWSHIPS, TRAINEESHIPS AND TRAINING GRANTS, BY DETAILED FIELD: FY 1969, 1975-81

(dollars in thousands)

FIELD OF SCIENCE/ENGINEERING	1969	1975	1976	1977	1978	1979	1980	1981
Physical Sciences, Total	n.a.	3,238	3,049	3,675	1,441	5,489	4,691	6,212
Mathematical/Computer Sciences, Total	n.a.	2,389	1,956	1,875	558	1,558	1,336	994
Environmental Sciences, Total	n.a.	3,285	1,629	764	663	1,507	1,326	1,845
Engineering, Total	n.a.	10,821	8,100	10,015	12,673	13,727	10,735	4,637
Life Sciences, Total	n.a.	135,600	105,631	118,799	130,853	136,009	156,375	148,460
Psychology, Total	n.a.	12,819	9,541	17,274	16,937	15,296	8,204	3,700
Social Sciences, Total	n.a.	30,243	39,743	21,755	20,311	18,198	27,180	17,485
Other Sciences, NEC	n.a.	2,878	5,222	10,514	22,489	13,082	13,239	31,582
Total (millions)	436	201	175	175	206	205	223	215

Note: Data for each year reflect support from the Agencies included in the survey system for that year.

Source: National Science Foundation.

APPENDIX I

ESTIMATES OF SUPPORT TO GRADUATE STUDENTS IN 1980/81

There is no recent survey of amounts expended for the support to graduate students. Under these circumstances, in order to derive estimates of available support to these students a complicated procedure had to be followed. It relied on a variety of sources for data. This appendix details this procedure.

We shall divide our discussion into several parts. First, we shall explain how the number of graduate student stipends was estimated. Next, we shall detail our procedure for allocating the stipends, by type, to major discipline groups. Third, we will present the estimats of amounts paid for each stipend by discipline. Fourth, a summary will show the amounts paid by type of stipend by discipline group. All these stpes relate to the estimates of student support in our first methodology.

After considerable research, we used the data compiled by the Council of Graduate Schools to estimate the total number of stipends -- fellowships, traineeships, research assistantships and teaching assistantships. The decision was based upon a comparison of the data collected by the Council in 1972 with the last complete census of employees conducted by the National Center for Educational Statistics.[1] During that year, the Council's members reported employing 101,764 assistants. The schools which answered the survey awarded 77.1 per cent of the doctorates during that year. We inflated this figure for non-reporting, and arrived at an estimate of 132 thousand assistants, a figure which is very close to the 137 thousand counted that year by the National Center for Educational Statistics. The same series was used to arrive at a figure of 172 thousand research and teaching assistants for 1980/81.[2]

The next challenge was to allocate this figure between research and teaching assistants. In 1972, 61.7 per cent of all assistants were teaching assistants. Among doctorate recipients in 1981, among those holding either research or teaching assistantships, 53 per cent reported being supported by teaching assistantships, and 47 by research assistantships. It seemed reasonable to adopt the later proportion. The number of teaching assistantships was thus set 90.4 thousand, and the number of research assistants accounted for the remaining 82 thousand.

The step-by-step allocations are shown below:

I. Total number of fellowships and traineeships:

1. Reported by the Council of Graduate School Survey: 24,182.
2. Total enrollment reported in the survey: 571 thousand students.
3. Total enrollment reported by NCES: 1,343 thousand students.
4. Ratio of three divided by two: 2.35
5. Estimated number of fellowships and traineeships: ((1) times (4)) 56,870.

II. Methodology to inflate the number of fellowships and traineeships for science/engineering fields.

1. NSF program information on number of fellowships in 1980/81 -- 1,750 -- and program information from NIH on number of fellowships and traineeships in life sciences -- 4,253 -- for a total of 6,053.

2. Number of fellowships and traineeships reported as major source support for these two agencies in National Science Foundation Tabulations of Graduate Student Support -- 5,412.

3. Ratio of (1) over (2) is 1.11.

III. Allocation by discipline group

1. For each of the four science and engineering specialties, physical sciences, engineering, life sciences, and behavioral sciences, number of fellowships and traineeships supported by non-foreign sources was multiplied by 1.11, the ratio derived from step II. The total in this group was estimated at 39,840. (See Table IV-A-1, Graduate Student Support, Fall 1980, op. cit.)

2. The number of fellowships and traineeships for other disciplines was arrived by subtraction from the 56,870 figure derived in step I. It was equal to 17,030.

IV. Total number of research and teaching assistantships

1. Reported by the Council of Graduate Schools Survey cited above: 100,744.

2. Ratio of enrollment of schools reporting to total school enrollment: 58 per cent.

3. Estimated total number ((1) divided by (2)): 171,975.

4. Allocation to research and teaching assistant categories: 53 per cent research assistants, and 47 per cent teaching assistants as per discussion above (see text).

V. Distribution of teaching assistants and research assistants by discipline.

1. The proportion of teaching assistants was allocated first by major group, all science/engineering and other categories. The ratios were derived from Syverson, op. cit. Table 3.

2. Within science/engineering industry groups, the number of research assistants and teaching assistants was distributed to arrive at a pre-determined total from step (1) above. The number of research assistants and other support reported in the National Science Foundation, Graduate Support ibid., was equal to the number of

research assistants estimated in step (1) above. The number of teaching assistants was multiplied by 1.3 (this ratio was estimated by dividing the number of teaching assistants in step (1), 70,330, by the reported number, 54,075, in *Graduate Support*, *ibid*.) for each of the four groups of disciplines, physical sciences, engineering, life sciences and behavioral sciences.

V. *Stipends*.

1. Government stipends were derived as follows: for the physical sciences, NSF stipends to students and institutional allowance were added. For life science, the NIH program information on stipends and tuition payments were added. The physical science level was used for engineering students. In the case of the social sciences, the average stipends of research assistants in economics and the median tuition estimated by ETS were added together. The median stipend to research assistants was taken from Council of Graduate Schools, *ibid*.

2. School and others. Teaching and research assistants stipends by discipline were taken from *Council of Graduate Schools*, *ibid*. Since 15 per cent of students have multiple stipends, and all those with government stipends receive an institutional allowance or tuition payment, only 85 per cent of the median tuition was imputed to the stipend of these students.

The number of stipends by source and the amounts paid are reproduced in Appendix Table I and summarized in text Table 8.

APPENDIX TABLE 1

NUMBER OF STIPENDS BY TYPE AND DISCIPLINE 1980/81

	Physical	Engineer	Life	Social	Other	Total
Fellowships and Traineeships	4,355	4,300	18,200	12,985	17,030	56,870
Federal	1,350	1,160	13,380	5,090	5,710	26,690
School	2,250	1,750	3,880	6,500	9,785	24,165
Other	755	1,390	940	1,395	1,535	6,015
Research Assistantships	16,035	17,215	20,020	14,745	13,930	81,945
Federal	11,613	10,105	8,808	4,085	2,100	36,711
School	2,898	4,128	8,699	8,590	9,790	34,105
Other	1,524	2,982	2,513	2,070	2,040	11,129
Teaching Assistantships	22,285	8,285	14,220	15,540	29,710	90,040
Federal	135	110	310	155		770
School	22,095	8,045	13,755	15,285	29,710	88,890
Other	55	70	155	100		380
Total Stipends	42,675	29,800	52,400	43,270	60,670	228,855
Federal	13,098	11,435	22,498	9,330	7,810	64,171
School	27,243	13,923	26,334	30,375	49,285	147,160
Other	2,334	4,442	3,608	3,565	3,575	17,524
Amount Per Student (dollars)						
Federal	8,200	8,200	9,080	7,395	7,255	
School and Other	7,450	7,450	7,450	6,960	6,820	

Source: See text.

APPENDIX FOOTNOTES

[1] Richard M. Beazly, Number of Employees in Institutions of Higher Education, Fall 1972, Washington, D.C., National Center for Education Statistics, U.S. Department of Health, Education and Welfare/Education Division, U.S. Government Printing Office: 1976.

[2] See text footnote 2.